University of Alberta

Processes Underlying Children's Responses to Witnessing Physical Aggression in Their Families

by

Judee E. Onyskiw ©

A thesis submitted to the Faculty of Graduate Studies and Research
in partial fulfilment of the requirements for the degree of Doctor of Philosophy

Faculty of Nursing

Edmonton, Alberta

Fall 1999

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children have a right to grow up in families free from violence

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Abstract

According to the National Longitudinal Survey of Children and Youth (NLSCY), 8% of Canadian children aged 4 to 11 years have witnessed physical aggression in their families. This study used structural equation modeling to test the hypotheses that intra-family aggression affects children: (1) because of observational learning / modeling of aggressive behaviour, and (2) because intra-family aggression disrupts mother's ability to provide warm, responsive parenting. The study examined whether there were effects due to the child's age or gender, and if there were differences depending on whether the information was provided from the mother or the child.

The sample included 3,014 preschool (4 to 5 years), 5,553 young school-age (6 to 9 years), and 2,654 older school-age (10 to 11 years) children. Mothers provided information for both parent and child variables for all children and 2,174 of the older school-age children self-completed their own questionnaires.

Results showed that the theoretical perspectives provide a reasonable explanation for understanding the processes underlying children's adjustment. Children who witnessed aggression more frequently behaved more aggressively themselves. Children were also affected because mothers were less able to provide warm, responsive parenting. Less maternal responsiveness was associated with an increase in both physical and indirect aggression (i.e., manipulative behaviour), internalizing behaviours, and a decrease in prosocial behaviours in children. Depressive symptoms in mothers contributed to children's internalizing behaviours. Children who were more sad, withdrawn, and depressed behaved more aggressively.

There were more similarities than differences in children's adjustment in the different age groups. Across all age groups, boys used more physical aggression, less indirect

aggression, and were less socially competent than girls. Gender did not influence children's internalizing behaviours. The model explained 25.5% to 33.6% of the variance in physical aggression, 15.1% to 26.9% in indirect aggression, 15.0% to 17.4% in internalizing behaviours, and 12.6% to 18.9% in prosocial behaviours for children in the different age groups. The model had a better fit when the data used were provided by mothers rather than both mothers and children because of the divergence between mothers' and children's reports.

ACKNOWLEDGEMENTS

I would like to express my sincerest appreciation to my supervisory committee: *Dr. Margaret Harrison*, my supervisor, for her scholarly advise, guidance, and encouragement throughout my doctoral studies and the development of this dissertation; *Drs. Louise Jensen, Dianne Kieren, and Phyllis Giovannetti* for their interest and contribution to my work. It has been a privilege to learn structural equation modeling from *Dr. Leslie Hayduk* who has such expertise and passion for this statistical technique. I gained immensely from the time we had together examining over 1000 pages of LISREL output! I would like to thank *Dr. Jacquelyn Campbell*, my external examiner, whose passion and commitment to research in family violence is an inspiration.

It has been my privilege to be surrounded by so many dedicated PhD students and candidates over the years who shared so much of their knowledge. I will always be indebted to *Marilyn Hodgins* who provided constant support and encouragement, knowledge, and expert advise on virtually every aspect of my doctoral work. No matter how busy she was -- she was always available to help me. I would like to thank *Dr. Jeanne Besner* who always encouraged and supported my endeavours. It has been truly been a privilege to have these scholars as my colleagues and friends.

My doctoral studies and dissertation work would not have been possible without the love, unfailing support, and encouragement of my family. My husband *John Onyskiw* was a source of strength and inspiration, always urging me on when the journey seemed endless! I sincerely appreciated all the help with family and home responsibilities so that I could have more time to devote to my work. I want to thank my son *Jason* whose obvious pride in his mother is so motivational; my daughter *Robyn*, whose keen sense of humour always lifted my spirits and put things into proper perspective; and my daughter *Lara* whose computer, organizational, and secretarial skills were invaluable to me. No one could ask for a more conscientious research assistant!

My research was made possible in part by Health Canada through a National Health Research and Development Program research training fellowship, an Alberta Heritage Foundation for Medical Research fellowship, a Hospital for Sick Children (Toronto) fellowship, a Walter H. Johns Graduate fellowship, and a research grant from the Children's Health Foundation of Northern Alberta. I am sincerely grateful for all the financial support that I received throughout my doctoral studies. The financial assistance allowed me to concentrate my energies on my studies and to truly gain from my graduate education.

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CHAPTER 1

INTRODUCTION

Individuals in a significant number of Canadian families use physically aggressive behaviour toward other family members to resolve conflict. There is serious cause for concern about the effects of exposure to aggression on the children living in these families. The early family environment plays a salient role in children's social and emotional development and the quality of the environment in which children are raised has profound effects on children's health, well-being, and competence in later life (Hertzman, 1994; Hertzman & Weins, 1996; Keating & Mustard, 1993). Warm, responsive care in a safe, nurturant family environment fosters optimal social and emotional development in children. Moreover, families provide powerful role models for children's own behaviour. Children's exposure to family member's use of physical aggression may contribute to the intergenerational transmission of violent behaviour.

Research focusing on children's exposure to intra-family physical aggression has demonstrated detrimental effects on children's overall adjustment. Exposure to intra-family physical aggression has been associated with emotional and behavioural problems and lower levels of social and cognitive competence (Jaffe, Wolfe, & Wilson, 1990; Rossman & Rosenberg, 1992). While there is a large body of literature documenting modest but consistent associations between exposure to interparental aggression and children's psychological adjustment and competence, much less is known about the mechanisms underlying this association (Fincham, Grych, & Osborne, 1994).

One explanation that has been proposed to explain the association between intra-family physical aggression and children's adjustment difficulties is the effect of observational learning and role modeling. Children observe and then imitate the aggressive behaviours which they observe in their family. Intra-family aggression could also affect children's adjustment indirectly by the impact that it has on parenting practices which in turn affect children's adjustment. It is important to understand the causal mechanisms that account for the association between intra-family aggression and children's adjustment difficulties. This information is needed in order to develop effective treatment and prevention efforts as well as public policies to reduce the risk to children (Rutter, 1994).

Scope of the Problem

Violence in families has occurred throughout history. It is neither a recent nor a rare phenomenon. In the last three decades the growing awareness of family violence has spurred a proliferation of research to understand the nature of this serious social problem. The true scope of all forms of family violence (i.e., spousal, child, sibling, and elder abuse) is not known because accurate prevalence estimates are difficult to obtain. There is only an estimate of the prevalence of violence against women in Canada. According to the first national survey conducted in 1993, 29% of women (2.7 million) who had ever been married or lived common-law have been assaulted at some point in their relationship (Rodgers, 1994). While this is the most accurate estimate available, it is still conservative since the survey was limited to households with telephones and to participants who could speak either of the two official languages. In addition, it is generally recognized that wife abuse is greatly under-reported (Finkelhor, 1993).

According to the 1993 national survey, 39% of the women reported that their children witnessed the assault against them (Rodgers, 1994). In 52% of the violent incidents that children witnessed, women feared for their lives and in 61% of the violent incidents witnessed by children, women were physically injured. Of women seeking refuge in Canadian shelters for abused women, 78% of women indicated that children witnessed the violence against them (Trainor, 1999). An earlier research project in Toronto indicated that 68% of 2,910 wife assault incidents were witnessed by children (Leighton, 1989). While parents tend to minimize or deny the presence of their children during violent incidents, clinicians relate that children are often able to describe detailed accounts of incidents that parents were unaware they had witnessed (Jaffe et al., 1990; Markward, 1997). Further, *witnessing* is only a crude measure of children's *awareness* of the existence of violent behaviour in their families. Children may be aware of violence without directly observing or hearing any aggressive acts.

Significance of the Problem

Research has shown that children's exposure to aggressive behaviour in families is associated with a wide range of adjustment difficulties. Children exposed to intra-family aggression are at risk for psychological maladjustment, behavioural problems, lower levels of social and cognitive competence (Jaffe et al., 1990; Rossman & Rosenberg, 1992), and physical health problems (Davis & Carlson, 1987; Kérouac, Taggart, Lescop, & Fortin, 1986).

Until recently, young children's behaviour problems were considered transient problems that would resolve when children matured. Evidence now suggests that behaviour problems starting early in life are likely to persist. Externalizing behaviour problems such as aggression, noncompliance, and disobedience with authority figures are highly stable throughout the childhood years and are predictive of antisocial behaviour, school drop-out, and criminality in adolescence (Campbell, 1995; Rubin, Stewart, & Chen, 1995). Behaviour problems are currently the most frequent reason for psychiatric referrals. With the exception of childhood psychosis, problems of this nature have the worst prognosis of any childhood disorder (Offord, Boyle, Fleming, Blum, & Grant, 1989). Consequently, these problems result in a tremendous cost to children, their families, and society in general.

Children with internalizing behaviours such as anxiety, withdrawal, and depression are at risk for adolescent problems of this nature (Rubin et al., 1995). Moreover, these behaviours also put children at risk for failing to develop the necessary social skills for healthy relationship experiences important for individuals' well-being in later life (Rubin & Mills, 1991).

The disruptive nature of externalizing behaviours are quite visible and likely to evoke negative reactions in parents, teachers, and peers (Rubin & Mills, 1991). The highly visible nature of these difficulties and the fact that they are so disruptive to others, however, means that identification, assessment, and intervention are more likely to occur for children with externalizing behaviours than for children with internalizing behaviours. Manifestations of internalizing behaviours are less visible to others and less likely to evoke the same negative reaction as externalizing behaviours. The quiet, withdrawn, and silent nature of children with internalizing behaviours may even be falsely interpreted as compliant, model behaviour. Consequently, children with internalizing behaviours may go undetected and ignored until the problems become quite pronounced.

Children with behavioural manifestations of both an internalizing or an externalizing nature clearly warrant early intervention. This is particularly important because behavioural problems tend to be less responsive to therapeutic intervention when children get older and the behaviours become well established in their personalities (Dulmus & Wodarski, 1997; Grizenko, Sayegh, & Papineau, 1994). Behaviour problems are particularly stable in certain family contexts. They are more likely to persist in children who live in families that continue to experience unstable family environments and poor family relationships.

Nurses in both acute care settings and community health settings often provide support and education to parents concerned about their children's behaviour and/or their parenting practices. Yet, despite the high prevalence of violence in families, it is well recognized that health care professionals often fail to screen clients for the presence of such behaviour in their family (Hamberger, Saunders, & Hovey, 1992; Novello, Shosky, & Froehlke, 1992; Tilden et al., 1994). Nurses working from an individual perspective may not consider the contribution of contextual factors implicated in children's psychological and behavioural difficulties. Failure to consider family factors may lead to delayed identification and intervention and/or inappropriate intervention for children with these adjustment difficulties and ultimately to a poorer prognosis.

Nurse researchers have made important contributions to the interdisciplinary knowledge base about violence in families. Research on children's adjustment in families characterized by intra-family aggression is needed in order to expand existing knowledge in this area of research. Greater understanding of the mechanisms that account for the association between intra-family aggression and children's adjustment difficulties may point to potential areas of intervention for nurses and other health care providers. This information will contribute to the interdisciplinary body of knowledge about family violence.

Purpose of the Study

The purpose of this study is to expand understanding of the impact that exposure to intra-family aggression has on children's adjustment by testing the causal mechanisms involved. The primary objective is to test the hypothesis that exposure to physically aggressive behaviour in the family affects children's adjustment through two mechanisms. The mechanisms postulated are that exposure to physical aggression in the family affects children because of observational learning / modeling and because intra-family physical aggression disrupts normal parenting practices. There are three secondary objectives for the study: (1) to determine whether there are differential effects for preschool, young school-age, and older school-age children, (2) to determine whether gender influences children's responses to witnessing intra-family physical aggression, and (3) to determine if there are differences depending on whether reports of maternal responsiveness and children's adjustment are collected from the mother or the child.

A large nationally representative sample of Canadian children was used. Methodological strengths of the study include: control of demographic variables and several

risk factors known to be related to children's adjustment difficulties and parenting responsiveness (i.e., maternal depression, maternal alcohol consumption, family tension related to alcohol consumption), examination of the influence of gender on children's responses, examination of the differential effects for preschool, young school-age, older school-age children, use of children's and parent's reports in a subset of the sample, and the use of sophisticated data analytic techniques which permit the testing of causal mechanisms.

CHAPTER 2

LITERATURE REVIEW

The literature review focuses on three central issues. First, an analysis of empirical findings on the relationship between children's exposure to intra-family physical aggression and adjustment difficulties is presented. Second, the shortcomings of existing research are identified. Finally, theoretical approaches to understanding the impact of witnessing intra-family physical aggression on children's adjustment are discussed.

Pertinent descriptive and empirical literature in the disciplines of nursing, medicine, psychology, sociology, and women's studies were reviewed. Several strategies recommended by Cooper (1989) were used to locate the literature. Computerized databases were searched including: CINAHL (1982 to December 1998), Medline (1987 to March 1999), PsycINFO (1984 to January 1999), and Sociofile (1974 to December 1998). Descriptors used to identify articles of interest in each of the databases were: domestic violence (including family violence, wife and spousal abuse, physical aggression, interspousal aggression, marital aggression, marital discord, marital conflict, sibling abuse), and psychological adjustment, behaviour problems, and/or social competence of children. Reference lists of articles and books were reviewed for reference to any article that had not been identified through other sources. Finally, recent issues of relevant journals (i.e., 1999) were hand searched (e.g., Child Abuse & Neglect, Child: Care, Health, and Development, Child Development, Families in Society, Journal of Family Issues, Journal of Family Psychology, Journal of Family Violence, Journal of Interpersonal Violence, Journal of Youth and Adolescence, Psychological Bulletin, and Violence & Victims). The search was limited to published materials and only those written in English. The review was not exhaustive, however, the literature most salient to this issue was considered and addressed.

Literature on the effect that all forms of family aggression as a gestalt have on children's development has only recently been addressed. More frequently, the literature focused on two predominant forms of intra-family aggression, the impact of witnessing violence against women and the impact of child abuse on children's development. This limitation is not surprising given the recency with which the research community has addressed the social problem of violence in families and the difficulties associated with measuring this phenomenon. Family violence as a topic of research is still in a state of evolution but there is increasing recognition by the clinical and research community that many

forms of family aggression are overlapping (Emery, 1989; Hughes, Parkinson, & Vargo, 1989; Markward, 1997; McKay, 1994; O'Keefe, 1995; Wolak & Finkelhor, 1998). With the exception of a few studies that examined the impact of different forms of aggression on children's developmental outcomes (Hughes, 1988; Hughes et al., 1989; Jouriles & Norwood, 1995; McCloskey, Figueredo, & Koss, 1995; O'Keefe, 1994), the vast majority of studies examined the effects on children of witnessing interparental aggression without probing for other forms of aggression co-existing in the family. No studies were identified in this review that examined the effect of children witnessing physical aggression between older siblings or between siblings and parents. Consequently, the predominant literature to inform this review was literature on the impact on children of witnessing interparental physical aggression.

Early Research on the Impact of Marital Discord and Divorce on Children's Adjustment

The first source of information concerning the impact of the family environment on children's behaviour was a small body of literature on the impact on children of parental separation and divorce (Emery, 1982; Furstenberg, Nord, Peterson, & Zill, 1983; Hetherington, Cox, & Cox, 1982; Jacobson, 1978; Long, Forehand, Fauber & Brody, 1987; Peterson & Zill, 1986; Porter & O'Leary, 1980). In general, these studies found that children who had adjustment problems post-divorce also had problems pre-divorce, suggesting that discord within the family may be a more significant factor than disruption of the family unit. Informed by this research, investigators then examined the association between marital discord and children's psychological adjustment (Emery & O'Leary, 1984; Johnston, Gonzàlez, & Campbell, 1987; Wierson, Forehand, & McCombs, 1988). Links were identified between marital discord and children's psychological problems (Johnston et al., 1987; Porter & O'Leary, 1980), behavioural problems (Emery & O'Leary, 1984; Johnston et al., 1987; Porter & O'Leary, 1980), and social competence (Wierson et al., 1988).

Specific aspects of marital discord were most closely associated with children's adjustment difficulties (Fincham, 1994; Fincham & Osborne, 1993; Jouriles, Farris, & McDonald, 1991; Jouriles, Murphy et al., 1991). Discordant marriages characterized by overt conflict, hostility, and aggression were more disturbing to children than discordant marriages characterized by distancing, indifference, and withdrawal. The latter behaviours are generally more covert to children. Overall, marital conflict was found to be a better predictor of children's adjustment problems than global measures of marital distress, discord, or dissatisfaction. For instance, Porter and O'Leary (1980) found no correlation between a

global measure of marital satisfaction and boys' behaviour problems. However, overt marital conflict was significantly correlated with behaviour problems. Similarly, Johnson and O'Leary (1987) showed that mothers of conduct-disordered girls did not differ in terms of marital satisfaction from a comparison group of mothers of girls without conduct disorders but the mothers differed in terms of the amount of overt hostility expressed in their marital relationships. Jacobson (1978) found a significant relationship between interparental hostility and a range of children's behaviour problems. Emery (1982) maintained that the most significant stressor for children was the amount of conflict to which they were exposed. After extensively reviewing the literature on children with a depressed parent, a factor known to place children at risk for a range of problems, Downey and Coyne (1990) concluded that marital conflict was a "viable alternative explanation for the general adjustment difficulties of children with a depressed parent" (p. 68). Consequently, research examining specific aspects of marital discord advanced understanding of the nature of its association with children's adjustment (Fincham et al., 1994; Fincham & Osborne, 1993; Jouriles, Farris, & McDonald, 1991; Jouriles, Murphy et al., 1991).

A number of laboratory studies supported this conclusion. Under controlled, experimental conditions, Cummings and his colleagues showed that both toddlers and preschool children who observed or even just overheard conflict between adults responded with emotional distress, anger, and aggression (Cummings, 1987; Cummings, Zahn-Waxler, & Radke-Yarrow, 1981; Cummings, Zahn-Waxler, & Radke-Yarrow, 1984). Further, the probability of distress was heightened when adults' angry interactions included the use of physical aggression. El-Sheikh and Cheskes (1995) demonstrated that school-age children perceived both arguments between two adults and arguments between an adult and a child as negative in affect, and responded with anger and distress. Children reported feeling more distressed when arguments between an adult and child included the use of physical aggression (Cummings et al., 1981; El-Sheikh & Cheskes, 1995).

Studies on children's response to conflict helped to focus research on children's observations of interparental physical aggression, a particularly negative form of marital conflict. Children exposed to physical aggression between their parents manifested behaviour problems in the clinical range (i.e., a severity level equivalent to children seen in mental health settings). Interparental physical aggression predicted child behaviour problems even after measures of marital discord were statistically controlled (Jouriles, Murphy, & O'Leary, 1989). Moreover, children exposed to physical aggression exhibited greater adjustment problems than children exposed to verbal aggression alone (Fantuzzo et al., 1991).

Research Examining the Link Between Interparental Aggression and Children's Adjustment

Overview of Study Methodologies

In the last two decades, 38 studies, using various methodologies and diverse populations, examined the relationship between interparental physical aggression or overt hostility and various forms of child adjustment in preschool and school-aged children (Appendix A). Most research has been undertaken to develop an understanding of two major dimensions of childhood psychopathology, adjustment problems expressed as internalizing or externalizing behaviours. Internalizing involves behaviour that is over-controlled, anxious and inhibited (e.g., sadness, withdrawal, somatic complaints, fear, and anxiety). Externalizing involves behaviour that is under-controlled, aggressive, and antisocial (e.g., aggression, disobedience, noncompliance, and destructiveness). Studies have also assessed related factors that are foundations of normal child development such as social and cognitive competence.

Samples

The majority of samples were recruited from children accompanying their mothers to shelters or transition houses for abused women (Bookless-Pratz & Mertin, 1990; Christopoulos et al., 1987; Copping, 1996; Davis & Carlson, 1987; Fantuzzo et al., 1991; Gleason, 1995; Holten & Ritchie, 1991; Hughes, 1988; Hughes & Barad, 1983; Hughes, Parkinson, & Vargo, 1989; Jaffe, Wolfe, Wilson, & Zak, 1985, 1986a, 1986b; Jouriles, Norwood, McDonald, Vincent, & Mahoney, 1996; Markward, 1997; Mathias, Mertin, & Murray, 1995; McCloskey et al., 1995; O'Keefe, 1994; Rossman & Rosenberg, 1992; Smith, Berthelsen, & O'Connor, 1997; Westra & Martin, 1981; Wolfe, Jaffe, Wilson, & Zak, 1985; Wolfe, Zak, Wilson, & Jaffe, 1986). Other samples recruited children whose parents were referred for marital therapy (Hershorn & Rosenbaum, 1985; Jouriles et al., 1989; Rosenbaum & O'Leary, 1981). One unique study recruited children of parents referred for mediation for custody disputes following divorce (Johnston et al., 1987). Other samples were recruited from children who were referred for therapy for behaviour problems (Emery & O'Leary, 1982; Jouriles, Barling, & O'Leary, 1987; Kolbo, 1996; Porter & O'Leary, 1980). A smaller number of studies used samples of children recruited from the general population (Emery & O'Leary, 1984; Johnson & O'Leary, 1987; Jouriles, Murphy et al., 1991; Jouriles, Pfiffner, & O'Leary, 1988; Spaccarelli, Sandler, & Roosa, 1994; Sternberg et al., 1993).

The majority of studies were conducted in the United States but several studies were conducted in Canada (Copping, 1996; Jaffe et al., 1985; 1986a; 1986b; Wolfe et al., 1985; Wolfe et al., 1986). Two studies were conducted in Australia (Bookless-Pratz & Mertin, 1990; Mathias et al., 1995) and one study was conducted in Israel (Sternberg et al., 1993).

Measures

Assessment of interparental aggression. Since researchers began studying violent behaviour in families, various definitions of violence have been used to connote physically aggressive behaviour. Most often, physical aggression has been used interchangeably with physical conflict, violence, and abuse. Although these words are used synonymously, scholars have pointed out that there are some slight conceptual differences (Gelles & Cornell, 1985; Gelles, 1993). The lack of consensus has been a significant and enduring problem in this field of research and a source of great debate. The lack of consistent definition is critical because differences in conceptualization affect measurement and ultimately make comparison across studies difficult.

A variety of methods were used to assess interparental aggression in the studies reviewed. Several studies assessed interparental physical aggression using parents' self-reported history. The majority of studies, though, used standardized measures which parents (i.e., mostly mothers) completed. The most commonly used instrument was the Conflict Tactics Scale (CTS; Straus, Gelles, & Steinmetz, 1980). The remaining studies used the O'Leary-Porter Scale (OPS; Porter & O'Leary, 1980). Both instruments have limitations. The CTS, developed by Straus and his colleagues for a national American survey conducted in the 1980s, focuses on the frequency of specific behaviours that spouses use when interacting with each other. Behaviours are divided into three dimensions of conflict; verbal reasoning (i.e., discussed the issues calmly), verbal aggression (i.e., said something to spite the other one), and physical aggression (i.e., hit, shoved, or beat up a partner). The physical aggression subscale of the CTS sums across items inquiring about the frequency of specific incidents of physical aggression between partners but it does not specifically inquire about the frequency of children *witnessing* these aggressive acts. The OPS typically measures parents' reports of the extent to which their children *witnessed* incidents of marital conflict operationalized as marital disagreements and overt expressions of hostility including physical aggression. While this scale does specifically measure children's exposure to marital conflict, it includes a broader range of parental behaviour than just physical aggression (e.g., disagreements over child-rearing).

Assessment of children's adjustment. Various aspects of children's adjustment were measured with the vast majority of studies assessing children's internalizing and externalizing behaviours. A small number of studies also assessed areas of children's competence, such as social and cognitive competence, self-esteem and self-concept employing various standardized measures. Child adjustment was typically measured by parental report (i.e., mostly mothers) with the parent asked to rate the child's behaviours using standardized checklists. Three studies, however, did use observational methods with standardized procedures for scoring behaviours (Holten & Ritchie, 1991; Johnston et al., 1987; Jouriles et al., 1988). In several studies, children completed their own rating scales for some behaviours (i.e., depression, anxiety, and self-worth) (Christopoulos et al., 1987; Emery & O'Leary, 1982; Fantuzzo et al., 1991; Hughes, 1988; Hughes & Barad, 1983; Hughes et al., 1989; Johnson & O'Leary, 1987; Kolbo, 1996; Mathias, et al., 1995; McCloskey, et al., 1995; O'Keefe, 1994; Rossman & Rosenberg, 1992; Spaccarelli, Sandler, & Roosa, 1994; Sternberg et al., 1993; Westra & Martin, 1981). Infrequently, teachers or child care workers completed the rating scales usually in combination with parents (Emery & O'Leary, 1984; Gleason, 1995; Hughes & Barad, 1983).

A variety of instruments were used to measure child adjustment. Of most interest to this review are the behaviour checklists. The Child Behavior[1] Checklist (CBCL; Achenbach & Edelbrock, 1978), the Behavior Problem Checklist (BPC; Quay, 1977), and the Revised Behavior Problem Checklist (RBPC; Quay, 1977) were the instruments most frequently used. These instruments all have norms by gender and age groups.

The CBCL was the most frequently used instrument. Items in the scale generally load onto two factors identifying major groups of behaviours that are referred to as externalizing and internalizing behaviours (Achenbach & Edelbrock, 1978). Problems with aggression, noncompliance, and disruptive behaviours tend to co-exist as externalizing behaviours. These behaviours are often referred to as problems of under-control. Similarly, anxiety, depression, sadness, social withdrawal, and fearfulness tend to co-exist as internalizing behaviours and are often referred to as problems of over-control. The distinction between internalizing and externalizing behaviours was first identified by Achenbach and Edelbrock (1978) and has since become a frequently used categorization of children's emotional and behavioural problems.

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[1] Behaviour is spelled using the American version for instruments developed in the United States.

The BPC is the second most commonly used measure of child behaviour. This instrument has been factor analyzed into four subscales: Conduct Disorder, Personality Disorder, Inadequacy-Immaturity, and Socialized Delinquency. The Conduct Disorder Subscale measures aggressive, noncompliant, acting out behaviours and represents the externalizing dimension of behaviour problems. The Personality Disorder Subscale measures depression, sadness, low self-confidence and represents the internalizing dimension of behaviour problems. The revised version of this checklist (i.e., RBPC) has been factor analyzed into six subscales; Conduct Disorder, Socialized Aggression, Attention Problems/Immaturity, Anxiety/Withdrawal, Psychotic Behaviour, and Motor Excess. Results across studies using these different behaviour checklists are often compared although they measure somewhat different behaviours.

Overview of Study Findings

Research in this area used various methodologies, instruments, and samples to assess the relationship between interparental physical aggression and children's adjustment. Despite this, the vast majority of studies reported that interparental aggression was associated with a wide range of children's adjustment difficulties. Findings were summarized according to problems in major areas of children's adjustment.

Externalizing Behaviours

Generally, associations have been found between interparental physical aggression and children's aggressive, noncompliant, and disruptive behaviours (Bookless-Pratz & Mertin, 1990; Davis & Carlson, 1987; Emery & O'Leary, 1982, 1984; Fantuzzo et al., 1991; Hershorn & Rosenbaum, 1985; Holten & Ritchie, 1991; Hughes, 1988; Hughes & Barad, 1983; Jaffe et al., 1985, 1986a, 1986b; Johnston et al., 1987; Johnson & O'Leary, 1987; Jouriles et al., 1989; Jouriles et al., 1996; Jouriles et al., 1988; Mathias et al., 1995; Porter & O'Leary, 1980; Rossman & Rosenberg, 1992; Smith et al., 1997; Spaccarelli et al., 1994; Sternberg et al., 1993; Westra & Martin, 1981; Wildin, Williamson, & Wilson, 1991; Wolfe et al., 1985). When children who witnessed interparental aggression were compared to normative data, a higher proportion of children fell into the clinical range for externalizing behaviour problems on the behaviour checklists.

Internalizing Behaviours

Researchers reported links between interparental aggression and children's internalizing problems such as anxiety, withdrawal, depression, and somatic symptoms (Christopoulos et al., 1987; Davis & Carlson, 1987; Fantuzzo et al.,1991; Holten & Ritchie, 1991; Hughes, 1988; Jaffe et al., 1986a, 1986b; Johnston et al., 1987; Jouriles et al., 1996; Mathias et al., 1995; Smith et al., 1997; Spaccarelli et al., 1994; Sternberg et al., 1993; Wildin et al., 1991; Wolfe et al., 1985). A significant proportion of these children were reported as having problems indicative of severe disturbance.

Social Competence

Several researchers recognized that the significance of parental behaviour for children's adaptation extends far beyond the concurrent presence of behaviour problems, and studied other forms of adjustment difficulties. Associations were identified between exposure to interparental physical aggression and children's social competence (Davis & Carlson, 1987; Emery & O'Leary, 1984; Fantuzzo, et al., 1991; Jaffe et al., 1985, 1986a; Mathias et al., 1995; Rossman & Rosenberg, 1992; Wolfe et al., 1985, 1986). Children exposed to interparental aggression were found to be less socially competent than comparison groups of children. Children handled their frustration poorly, had inappropriate interpersonal skills, and lacked conflict resolution strategies, which led to poorer peer relations.

Cognitive/Intellectual Competence

Several studies examined the link between witnessing interparental physical aggression and children's cognitive competence. School related difficulties due to erratic attendance, poor performance, and school phobias have been reported (Moore et al., 1990; Scanlon, 1985). Children were distracted and inattentive in their academic tasks. Wildin and her colleagues (1991) found that 46% of school-aged children in their sample had one or more indicators of academic problems as measured by failing grades, repeating grades, and/or receiving special services in school; 39% of preschool children were classified as developmentally delayed. In comparison to normative samples, children who witnessed interparental aggression had significantly lower developmental skills (Gleason, 1995; Westra & Martin, 1981). Moore et al. (1990) reported that children scored lower on mathematical and reading ability than a comparison group of children and only 51% to 57% of the children who witnessed interparental aggression in Mathias, Mertin, and Murray's (1995) sample were

reading at a level appropriate for their age.

Physical Health

Several studies described the health problems experienced in this population of vulnerable children. The most common health problems reported were respiratory tract infections and allergies (Kérouac et al., 1986), headaches, stomach aches, diarrhea, and other gastro-intestinal disorders (Carlson, 1984; Hughes, 1986). Disturbances with sleeping, such as insomnia, nightmares, and sleepwalking have also been reported (Davis & Carlson, 1987; Kérouac et al., 1986).

Summary of Empirical Findings

While there is evidence to suggest that interparental aggression is positively correlated with children's adjustment difficulties, empirical evidence is often unclear, contradictory, and inconclusive. For instance, Wolfe et al. (1986) found that children recently exposed to interparental aggression had fewer interests, fewer social activities, and lower school performance, but they did not find significantly more internalizing or externalizing behaviours than a comparison group of children from nonviolent homes. Christopoulos et al. (1987) did not find more externalizing behaviour problems, less social or cognitive competence although they did find more internalizing problems than a comparison group of children matched on several demographic variables. Likewise, Hughes and Barad (1983) found no differences in the frequency of externalizing behaviour problems between shelter children and standardized norms. Rosenbaum and O'Leary (1981) did not find that children exposed to marital violence were significantly different from a comparison group of children randomly selected from women with satisfactory marriages or a second group of children of women in nonviolent but discordant marriages in terms of the number of children who had conduct disorders, inadequate-immature or delinquent behaviour. Focusing on the positive, Jouriles and his associates (1989) pointed out that 50% of children whose parents were referred for marital therapy were not exhibiting problems at clinical levels.

While depression has also commonly been reported in children exposed to marital aggression, neither is this evidence consistent. For instance, Davis and Carlson (1987) reported that 68% of preschoolers and 53% of school-aged children were in the clinical range for depression using maternal ratings of children's behaviour on a standardized measure. Hughes (1988), however, did not find significantly more depressive symptoms in children

exposed to interparental aggression than a comparison group of children from a similar economic background.

Variables in Children's Responses to Witnessing Physical Aggression

Children's responses to witnessing interparental aggression vary according to several factors. The child's age, particular stage of development, gender, and whether the child is also abused are the factors most frequently addressed. Other factors that may potentially play a role in children's responses are the intensity and frequency of the violence witnessed (Hughes, 1986; Jaffe et al., 1990), the mother's response to the violence, the number of other stressors the child experiences such as social and economic disadvantage, the number of moves and separations the child experiences, and any special needs that a child may have independent of the violence (Jaffe et al., 1990). These latter variables have not been systematically studied.

Gender of the child. Several researchers noted gender differences in children's responses (Christopoulos et al., 1987; Davis & Carlson, 1987; Emery & O'Leary, 1982; Hughes & Barad, 1983; Jaffe et al, 1985; 1986a; Kolbo, 1996; Porter & O'Leary, 1980; Spaccarelli et al., 1994); however, the differences do not consistently appear for the same type of adjustment difficulty. Some researchers found more notable problems in boys (Jaffe et al., 1986a; Hughes, 1988) while others found that girls appear to be more disturbed (Christopoulos et al., 1987; Davis & Carlson, 1987). In a meta-analytic review of 33 published studies assessing the relationship between marital discord (defined to include conflict, disharmony, and lack of parental agreement between married or separated parents) and children's externalizing behaviour problems, Reid and Crisafulli (1990) found the relationship stronger for boys than girls.

In four recent studies, not included in the aforementioned reviews, gender differences were reported in three studies. Spaccarelli et al. (1994) found that witnessing interparental aggression predicted conduct problems in 10 to 12 year old girls but not boys after controlling for the effects of a number of demographic and historical risk factors (i.e., maternal alcohol problems). Likewise, Kolbo (1996) reported that exposure to interparental aggression was strongly correlated with behavioural problems in girls but not boys. Sternberg and her colleagues' (1993) study supported this finding. They found that mothers reported more internalizing and externalizing behaviours in girls than boys. However, when child reports were used, girls reported only more externalizing behaviours than boys. On the other hand, O'Keefe (1994) did not find any gender differences in internalizing or externalizing behaviours

in a large sample of shelter children. Johnston et al. (1987) examined the interaction between age and gender in their analyses but found no evidence of an interaction or main effects for age or gender.

In the Ontario Child Health Study, a community survey of Ontario children 4 to 16 years of age, the frequency of externalizing behaviours was up to 10 times higher in boys than girls. The rates of internalizing behaviours, however, were similar for both sexes until adolescence. The pattern then shifted and girls had more internalizing behaviours than boys (Offord et al., 1989; Thomas, Byrne, Offord, & Boyle, 1991). Campbell's (1995) review of the literature on children's behaviour problems in the general population supports this finding. She argues that there is converging evidence in school-age children that indicates higher rates of externalizing problems in boys and a shift toward more internalizing problems in girls by early adolescence. Socialization practices may influence the expression of girls' and boys' behaviour problems (Keenan & Shaw, 1997; Lytton & Romney, 1991).

Age of the child. It is reasonable that children's responses would vary as a function of their age since children of various ages are differentially able to cope with stressors as a function of their cognitive abilities and socio-emotional capabilities. Clinicians have observed that younger children are most likely to respond with somatic complaints and regressive behaviour, returning to earlier levels of functioning, while school-aged children respond in sex-stereotypic ways with boys responding more aggressively and girls becoming more passive and withdrawn (Davis & Carlson, 1987). Younger children may be more distressed because their limited cognitive, verbal, and emotional abilities decrease their ability to understand and cope with stressful situations.

Mothers of younger children are also more likely to be depressed and anxious than mothers of older children (Hughes, 1986; Kérouac et al., 1986). Mothers experiencing marital aggression are distressed and often so emotionally overwhelmed by their own difficulties that it may disrupt their ability to provide responsive parenting and meet their children's emotional needs (Elbow, 1982; Henderson, 1993). Consequently, while preschool children need more nurturing and more help coping with stress than older children, their depressed, anxious, and overwhelmed mothers are less able to provide responsive parenting.

Empirical studies examining the influence of age are far from clear. Copping (1996) found that preschool shelter children were particularly vulnerable to the effects of witnessing interparental aggression. Davis and Carlson (1987) found that preschool shelter children

demonstrated more emotional problems, with a high percentage (68%) of children displaying clinically depressive symptoms. Likewise, O'Keefe (1994) found that age was an important predictor of adjustment difficulties with younger children exhibiting significantly more externalizing behaviours than older children. Their sample, however, did not include children under seven years of age. Hughes and Barad (1983) and Hughes (1988) found preschool shelter children more distressed than older children in two studies but were unable to replicate this finding in a third study (Hughes et al., 1989). In this latter study, the researchers found that younger school-aged children and older school-aged children coped less well than middle school-aged children. Unfortunately, the three studies used three different instruments (i.e., Achenbach's Child Behavior Checklist, Eyberg's Child Behavior Inventory, Quay's Behavior Problem Checklist) to measure child adjustment, so the divergent findings may be a reflection of measurement. Clearly, more investigation is warranted to understand the influence of age on children's responses.

Abuse status. Children in families characterized by interparental aggression are at increased risk for parent-child aggression. Both researchers and clinicians have noted that interparental aggression and parent-child aggression are clearly linked within families, with each being a fairly strong predictor of the other (Copping, 1996; Emery, 1989; Jaffe et al., 1986b; Jouriles & LeCompte, 1991; Jouriles & Norwood, 1995; Kolbo, 1996; McCloskey et al., 1995; McKay, 1994; O'Keefe, 1994, 1995; Wildin et al., 1991; Wolak & Finklehor, 1998). Research on domestic violence reveals a range from 30% to 87% of abused women reporting the presence of some form of parent-child aggression (deLange, 1986; Emery 1989; Hughes, 1988; Jaffe et al., 1986b; Jouriles & LeCompte, 1991; Jouriles & Norwood, 1995; Kolbo, 1996; McCloskey et al., 1995; Markward, 1997; McKay, 1994; O'Keefe, 1994; Ross, 1996; Scanlon, 1985; Straus, Gelles, & Steinmetz, 1980; Sternberg et al., 1993). While aggression directed at children is generally perceived to be more detrimental to children than witnessing aggression between parents, Jaffe and his colleagues (1986b) suggest that exposure to aggression in families may be as harmful to children as parent-child aggression. In their study of school-aged boys, boys exposed to interparental aggression had adjustment difficulties that resembled problems shown by boys who were abused and differed significantly from boys of non-violent families.

Other scholars suggest that involvement has more serious consequences for children than witnessing. In three studies of shelter children that used ratings of children's behaviour, researchers found significantly more distress in abused children exposed to interparental physical aggression (i.e., abused child witnesses) than in a comparison group of children, with

scores for nonabused children who had witnessed aggression (i.e., nonabused child witnesses) falling between the two groups (Davis & Carlson, 1987; Hughes, 1988; Hughes et al., 1989). Likewise, Copping (1996), using naturalistic observations to categorize shelter children's behaviour, found that children who were both witnesses and victims demonstrated more behaviour problems than children who only witnessed aggression. Markward's (1997) study supported this finding. Mathias and her associates (1995) reported that children were 2.8 times more likely to have internalizing behaviours in the clinical range if they had experienced aggression than if they had only witnessed it. McCloskey and her colleagues (1995) sampled 365 children recruited from shelters and the community who were between the ages of 6 to 12 years. Their analyses revealed that the different forms of aggression were highly interrelated and both contributed to a higher order "family violence" factor created for their sophisticated analysis. However, experiencing aggression from either parent added more weight to the factor than witnessing aggression.

Other researchers found that exposure to interparental aggression still influences children's adjustment even when parent-child aggression is controlled through sampling efforts or statistical analyses. For instance, Fantuzzo and his associates (1991) excluded children who were victimized in addition to being witnesses and found that exposure was associated with clinical levels of conduct problems as well as lower levels of social competence. Although Jenkins and Smith (1991) did not specifically measure physical aggression, they found that children's exposure to interparental conflict was significantly related to emotional and behavioural problems even after parent-child aggression was statistically controlled. Likewise, Salzinger and colleagues (1992) found that physical abuse had the most powerful effect on a child's behaviour but that witnessing interparental violence added to that effect. Finally, in a sophisticated study using multivariate analysis, O'Keefe (1994) examined how variables at the individual (i.e., child's age, sex, and temperament), family (i.e., witnessing interparental aggression, experiencing mother-child and father-child aggression), and community level (i.e., formal and informal social supports) predicted children's internalizing and externalizing behaviours in a sample of 185 shelter children. The amount of violence that children witnessed was a significant predictor of externalizing behaviours even when the effects of all other variables were partialled out. Interestingly, mother-child aggression (but not father-child aggression) significantly predicted internalizing behaviours.

There is additional support that exposure to interparental conflict accounts for children's adjustment difficulties even for children who are not victimized in a rather unique

study of children whose parents were in long-term custody disputes requiring court mediation. Parents in custody disputes so not *typically* abuse or neglect their children for fear they will lose the custody battle. Yet, Johnston and her colleagues (1987) found that these children were two to four times more likely to be clinically disturbed compared to population norms.

In contrast, Jouriles et al. (1987) found that after controlling for parent-child aggression, the association between marital aggression and children's behavioural problems was not significant. Sternberg and her colleagues (1993) found that children who witnessed interparental aggression did not differ considerably in behavioural problems from abused child witnesses. In terms of number of academic problems children experienced, Wildin and associates (1991) found that child witnesses did not differ significantly from abused child witnesses.

Critique of Existing Research

Knowledge concerning the effect of exposure to intra-family aggression on children's adjustment is still in its infancy. There are many inconsistent findings in this area of research. Consequently, the overall picture of children's experience remains unclear. The inconsistent findings may be related to methodological shortcomings of the studies. Many studies were descriptive to provide information on the adjustment difficulties of children who witnessed physical aggression. Many studies lacked comparison groups of children. Also, much of the research lacked a theoretical framework.

Sampling Issues

One methodological weakness has been the predominant use of convenience samples of children recruited from shelters and transition houses. These children cannot be assumed to be representative of all children exposed to interparental aggression. According to the recent Canadian survey, less than one-fifth of abused women sought refuge in shelters or transition houses when they left their partners (Trainor, 1999). The vast majority of women either stayed with friends, moved into a place of their own or stayed in a hotel. Women who use shelters tend to be more isolated, have fewer resources, lower socioeconomic status, and lack family and other forms of social support (Davis & Carlson, 1987; Trainor, 1999). They also tend to be women who experience more violent forms of aggression (Ratner, 1995). Thus, findings from a shelter population may not be generalizable to the total population of children who witness physical aggression in their families since they differ in terms of

socioeconomic status, severity and duration of abuse, and the availability of support systems.

In addition, children in shelters experience a number of other stressors independent of witnessing aggression. They are separated from family, friends, neighbourhood, and belongings. They live in communal living arrangements with strangers and often experience drastic changes in economic circumstances. Fantuzzo and his associates (1991) found shelter children who witnessed interparental aggression evidenced significantly higher levels of internalizing behaviours and lower levels of social competence than children who witnessed the same amount and type of interparental aggression but who lived in their own homes. Thus, it is entirely possible that shelter residence has influenced children's adjustment and the results of past research have been confounded. For all the aforementioned reasons, generalization from studies using shelter samples is questionable.

A second methodological weakness of past research is that sample sizes were often small. This hindered the ability to detect significant differences from comparison groups of children and to analyze subgroups of children to examine the influence of age and gender on children's responses. The majority of investigations grouped children of all ages together despite the fact that the age range was often quite broad (i.e., ranging anywhere from 1 to 12 years). The few studies that examined the influence of age found differences although the findings conflict on which age group was more at risk for adjustment difficulties. The influence of age in children's responses clearly warrants further investigation. Children of different ages may well be expected to differ developmentally and their responses to witnessing aggression may differ as a function of their developmental abilities. Understanding the influence of age and gender on children's responses is particularly important since this information would assist in developing appropriate intervention strategies.

Measurement Issues

The first measurement issue concerns the conceptualization and measurement of the concept of aggression. Past research has focused on measuring direct forms of aggression ignoring indirect forms of aggression. Direct forms of aggression focus on harming others through physical means (e.g., pushing, shoving, and hitting). The aggression is overt in nature. Indirect aggression is aggression that is more covert. It involves harming others through purposeful manipulation (e.g., retaliating by excluding certain children from activities) or damaging someone's peer relationships (e.g., gossiping about them). It is often referred to as relational aggression (Bjorkqvist, 1994; Crick, 1996). According to Grotpeter

and Crick (1996), girls are more likely to engage in this covert form of aggression than boys. Boys more typically demonstrate overt expressions of aggression such as physical aggression. It is entirely possible that greater specificity in defining the concept of aggression may lead to greater insight about gender differences.

The second measurement issue is the tendency to rely on one source for information on marital aggression and child adjustment problems. Most often, the mother provides information on both these variables, an approach which is problematic for several reasons (Grych & Fincham, 1990; Hughes 1988). First, the accuracy of maternal reports or perceptions of their children's functioning may be questionable. Mothers may under- or over-report depending on their defensiveness or wish to help their children. Second, mothers' perceptions may be distorted by their own level of psychological distress (Jaffe et al., 1986a, 1986b). Research has shown that mothers who experience marital aggression have significantly more physical and mental health problems than comparison mothers (Jaffe et al., 1985; Ratner, 1993; Rodgers, 1994). Distressed women may evaluate their children's behaviour more negatively than more objective observers (Hughes, 1988). Therefore, reports may be biased due to a negative response set associated with the mother's own victimization. In two studies which reported the correlations between mothers, fathers, and children's reports, there was a great deal of divergence in reports revealing obviously very different perspectives and underscoring the importance of collecting information from multiple sources (Jenkins & Smith, 1991; Sternberg et al., 1993).

Lack of Attention to Related Risk Factors

Past research has not addressed two important risk factors. It is possible that the association between witnessing aggression and children's adjustment is solely the result of other risk factors that occur with greater frequency in maritally aggressive homes. Parental depression and alcoholism both occur with greater frequency in maritally aggressive homes and both are related to children's adjustment difficulties. Yet, few researchers have considered these associated risk factors when assessing the impact of witnessing aggression on children's adjustment.

Parental Alcoholism

Research suggests that alcoholism is a prominent factor in marital aggression (Barnett & Fagan, 1993; Gelles, 1993; Murphy & O'Farrell, 1994) and children of alcoholics

experience symptomology similar to that of children who witness interparental aggression (Jaffe, Wolfe et al., 1990). The national Violence Against Women survey reported that the perpetrator was drinking alcohol in one-half of all violent partnerships (Rodgers, 1994). In a random sample of 406 married women living in the community, Ratner (1993) found that alcohol dependancy was associated with abuse. Compared to controls, 16.3% of physically abused wives and 11.3% of psychologically abused wives were alcohol dependent.

Spaccarelli and his associates (1994) found that maternal alcohol problems, assessed using two instruments, independently and significantly predicted girls' (but not boys) depression and conduct problems in their multivariate analysis of a community sample of children exposed to interparental aggression. Conversely, O'Keefe (1994) did not find that self-reported maternal alcohol problems significantly predicted children's internalizing or externalizing behaviours in their multivariate analysis. It is important to consider parental alcoholism in studies on children witnessing intra-family physical aggression.

Parental Depression

Depression in adults is common. According to a recent epidemiological survey of 3,956 people in Edmonton, Alberta, 5.9% of respondents had at least one episode of depression during the preceding year (Newman, 1994). Depression was found to be the most common mental disorder after alcohol abuse. Consistent with other surveys, depression was more common in women than men, and more common in women of child-bearing age than older women (Newman, 1994). This gender pattern exists not only in Canada. In a recent cross-national survey of 10 countries including Canada, the rates of depression were higher in women, and there was little variation in the mean age of onset of depression. The mean age ranged from 24.8 to 34.8 years (Weissman et al., 1996). At any given time, 8% of mothers are clinically depressed, a rate which increases to 12% in mothers who have recently given birth (Downey & Coyne, 1990). Family patterns exist. If one family member is depressed, another family member has twice the risk of depression (Newman, 1994).

Parental depression is a known risk factor for a full range of child behavioural and emotional problems, including depressive symptomology (Campbell, Kub, & Rose, 1996; Downey & Coyne, 1990; Grizenko & Pawlick, 1994; Phares & Compas, 1992), and lower levels of social competence (Goodman, Brogan, Lynch, & Fielding, 1993; Gross, Conrad, Fogg, Willis, & Garvey, 1995). Research has shown that depression interferes with mothers' ability to stimulate children's cognitive and social development (Field, 1995).

Maternal depression is strongly associated with marital conflict (Downey & Coyne, 1990; Goodman & Gotlib, 1999), and the relationship between depression and overt forms of marital conflict (i.e., physical marital aggression) has been well documented in literature on abused women (Campbell et al., 1996; Ratner, 1993). Depression is the most common mental health response to marital aggression. Despite this, and the fact that maternal depression is associated with similar child adjustment problems, only a few researchers have assessed for parental depression and then controlled for this variable in their analysis of children's adjustment difficulties. Christopoulos and her associates (1987) found significant differences in depressive symptomology between shelter mothers and comparison mothers using a standardized measure. Unfortunately, though, they did not then use a measure of depression as a covariate in their analysis of children's adjustment problems. McCloskey and her colleagues (1995) also found that shelter mothers showed greater symptoms of psychopathology. Family aggression was causally related to maternal symptomology in their structural equation model but interestingly, maternal symptomology appeared causally unrelated to child psychopathology. Finally, Jenkins and Smith (1991) found that overt marital conflict (not specifically physical aggression) explained a significant proportion of the variance in children's externalizing behaviours after controlling for maternal mental health.

Theoretical Approaches to Understanding the Impact of Witnessing Interparental Aggression on Children

Empirical findings suggest that children who witness interparental aggression are at risk for developing a wide range of adjustment difficulties. This vulnerability may be the result of several interrelated factors including the exposure to aggressive role models and to the marital discord that accompanies the aggressive behaviour, as well as to alterations in parenting practices that result from marital turmoil (Fincham et al., 1994; Grych & Fincham, 1990; Henderson, 1990; Humphreys, 1993a). Two hypothesis have been postulated to explain the association: the cycle of violence hypothesis and the disruption of normal parenting hypothesis.

The Cycle of Violence Hypothesis

The cycle of violence hypothesis is frequently used to explain the behaviours of children who witness interparental aggression. This hypothesis, based on social learning theory (Bandura, 1967; 1973), postulates that most human behaviour, especially social behaviour, is acquired through vicarious observational learning processes either by directly

observing the behaviour of others or through symbolic learning. Children learn styles of interacting by observing role models, and parents are the most important role models in children's lives, particularly in the early formative years. Children observe parents and then imitate parental behaviour when interacting with others. They learn aggressive behaviour the same way they learn other kinds of behaviour, through observation (i.e., watching adult behaviour) and by experience and practice (i.e., modeling adult behaviour). Behaviour learned in the family context is legitimized because the family provides both a model for learning aggressive behaviour and a supportive environment where such behaviour is considered appropriate and acceptable. Thus, the negative impact of witnessing physical aggression on children's adjustment may occur directly through training children by exposing them to aggressive models.

According to social learning theory, witnessing interparental aggression is more likely to lead to externalizing behaviour problems in children (Fincham et al., 1994; Fincham & Osborne, 1993). There is ample support found in numerous studies on children that exposure to interparental aggression was associated with increased levels of physically aggressive behaviour (Davis & Carlson, 1987; Jouriles et al., 1996; Rossman & Rosenberg, 1992; Smith et al., 1997). Even children's exposure to simulated angry situations that included the use of physical aggression in Cummings and his associates' analogue studies resulted in children acting more aggressively to playmates. This occurred with children as young as 18 months of age (Cummings, 1987; Cummings et al., 1981, 1984). Other research suggests that observational learning starts early in life. Crittenden and Bonvillian (1984) found that children aged 2 to 10 years interacted with their 6 to 11 month old siblings in a manner similar to how their maltreating mothers interacted with them. Adequately reared siblings increased in sensitivity as they grew older but maltreated siblings did not. George and Main (1979) found that physically abused children more frequently hit, slapped, and kicked their peers and assaulted or threatened to assault their caregivers in a day care than a control group of children matched for age, sex, and race.

In search of supporting evidence of modeling effects, researchers have frequently studied the backgrounds of adults and children and related such events to their subsequent use of aggression. In a review of 12 studies of delinquent children, Widom (1989) found that more-violent adolescent males were more likely to have experienced abuse or to have witnessed extreme physical abuse than nonviolent male adolescents. Straus and his colleagues (1980) noted that sons who witnessed their fathers' violent behaviour were ten times more likely to abuse their wives in later adulthood than boys of nonviolent parents. Other

retrospective accounts of abusive husbands indicated that the vast majority have witnessed similar behaviour in their families of origin (Herrenkohl, Herrenkohl, & Toedter, 1983; Rosenbaum & O'Leary, 1981).

There is criticism, though, that retrospective research overestimates the strength of any association since it assesses the relationship in samples of people currently behaving aggressively and fails to explain why some individuals do not demonstrate aggressive behaviour despite the fact that they have been exposed to it. Belief that behaviours learned within the context of the family are incorporated into individuals' repertoire of behaviours has led many researchers to conclude that exposure to aggression results in an inevitable cycle of violence. Children who witness or experience aggression will act aggressively toward others. Scholars who have critically reviewed the empirical evidence estimate that the rate of intergenerational transmission is approximately 30% $\pm$ 5% (Egeland, 1993; Kaufman & Zigler, 1987, 1993; Widom, 1989). A history of experiencing or witnessing aggression is a major risk factor for subsequent aggressive behaviour but is not sufficient in explaining all occurrences.

The Disruption of Parenting Hypothesis

Scholars suggest that there is another mechanism that may indirectly affect children's behaviour in families characterized by aggression. Exposure to interparental aggression not only directly influences children's adjustment through observational learning but also indirectly by its impact on parenting practices (Belsky, 1984; Davies & Cummings, 1994; Emery, 1989; Emery, Fincham, & Cummings 1992; Fauber & Long, 1991; Gable, Belsky, & Crnic, 1992; Holten & Ritchie, 1991; Jaffe, Wolfe et al., 1990; Rutter, 1994; Wolfe & Jaffe, 1991; Wolak & Finkelhor, 1998). Research has consistently shown that warm, sensitive parenting is linked to children's healthy social and emotional development and social competence (Campos, Barrett, Lamb, Goldsmith, & Stenberg, 1983; Collins, Harris, & Susman, 1995; Lewis, 1993; Stocker, 1993). Most psychological theories that explain the development of children's social and emotional growth (i.e., psychoanalytic, attachment, developmental, and behavioural theory) place great emphasis on the salience of the parent-child relationship and the quality of parenting interactions for the development of healthy adaptive child outcomes (Rubin et al., 1995). Moreover, supportive marital relationships have been shown to be associated with warm, responsive, and involved parenting in infants (Belsky, 1990; Cowan & Cowan, 1992), toddlers (Kerig, Cowan, & Cowan, 1993) and school-age children (Brody, Pellegrini, & Sigel, 1986).

Parents who are consumed and overwhelmed with their own marital problems though, become less involved and less effective in parenting (Henderson, 1990). This disruption in parenting in turn impacts on children's normal social and emotional development leading to adjustment difficulties.

Two particular dimensions of parenting impairment have been implicated: consistency in parenting and responsiveness of parenting interactions. Aggression in the marital relationship is related to parental inconsistency (Holten & Ritchie, 1991; Jouriles et al., 1987; Smith et al., 1997). Parents are often inconsistent in their own parenting practices or inconsistent with their partner's parenting practices (Smith et al., 1997). Aggression in the marital relationship is also linked with parental punitiveness (Brody, Arias, & Fincham, 1996; Hughes, 1988; Jouriles & Norwood, 1995; McKay, 1994; Smith et al., 1997) and parent-child aggression (Hughes et al., 1989; Jouriles & Norwood, 1995; McKay, 1994). The effects of parent-child aggression result in the same type of child adjustment problems as those seen in children exposed to interparental aggression (Jaffe, Wolfe et al., 1990; Jouriles et al., 1987, 1989).

The second dimension of parenting is responsiveness which is the expression of warmth in parenting interactions. To date, there were no investigations identified that examined the role of parental warmth in mediating children's responses to witnessing interparental aggression. Henning, Leitenberg, Coffey, Bennett, and Janowski (1997), however, have examined the role of parental warmth in mediating young adults' responses to witnessing conflict during their childhood. They reported that the young adults perceived their parents to be less caring and warm during childhood and a substantial portion of the variance accounted for in their psychological adjustment by interparental physical conflict was mediated through decreased parental warmth and caring.

Parental responsiveness and warmth is particularly important for children's normal development. According to Rohner (1991), there are maladaptive outcomes for children raised by unresponsive parents. In evidence amassed from extensive cross-cultural research on the effects of parental acceptance, researchers have found that children who perceive their parents to be lacking in warmth and responsiveness were more hostile and aggressive, had less self-esteem, were less able to cope with stress, and were less socially competent than children who perceived their parents to be warm towards them. Moreover, warm, responsive parenting has been shown to be a protective factor from psychological problems for children in both high and low risk populations. For instance, in children confronted with adversity, the risk of

serious problems has been ameliorated, though not negated, by receiving emotional support and attention from at least one parent (Egeland, 1988; Jenkins & Smith, 1991; Rutter, 1987, 1995; Werner & Smith, 1992).

Intuitively, it is reasonable to expect that parents experiencing marital aggression would be less able to respond warmly to their children. Research has shown that women who experience marital aggression have more somatic complaints, higher levels of anxiety, greater social dysfunction, and more depressive symptoms than comparison women (Jaffe et al., 1985, Ratner, 1993; Rodgers, 1994). The impact of depression on women's ability to parent effectively has been documented (Cummings & Davies, 1994; Downey & Coyne, 1990; Field, 1995), but any of these factors may impact on women's ability to provide effective, responsive parenting. Although there is only scant evidence of the effect of marital aggression on fathers' ability to parent, there is evidence that negativity in the marital relationship is related to a decrease in fathers' involvement in parenting (Brody et al., 1996). Further, studies on marital satisfaction have shown that fathers' parenting is influenced by the quality of the marital relationship (Belsky, 1990; Belsky, Youngblade, Rovine, & Volling, 1991; Cowan & Cowan, 1992; Owen & Cox, 1997).

Summary

In summary, children who witness interparental physical aggression exhibit increased rates of adjustment difficulties. They are at greater risk for both internalizing and externalizing behaviour problems and lower levels of social competence in contrast to children who have not had this same experience. Difficulties are found in children of all ages, in boys and girls, in community, clinic, and shelter samples. They emerge in observer reports as well as in self and parent reports.

Children's responses to witnessing aggression are not always consistent. It does appear that not all children are similarly affected by witnessing interparental aggression; there is in fact considerable heterogeneity in children's responses (Rosenberg & Rossman, 1990). Some differences in findings may be explained by variations in research designs, sample selection, and/or the different measures and instruments used. Some studies may have failed to find significant differences or relationships because they lacked sufficient statistical power due to small sample sizes. Alternately, it may be that certain factors protect some children or make others more vulnerable (Kolbo, 1996; Wolak & Finklehor, 1998).

Most research in this area has been descriptive or correlational and therefore the causal relationships (i.e., effects) cannot be determined. Moreover, whenever a relationship is found between two variables, it is always possible that it can be explained by a third variable. Consequently, the relationships remain poorly understood which hinders the ability to develop effective prevention and intervention strategies. There has been much theoretical discussion among scholars concerning the mechanisms that account for the relationship between interparental aggression and children's adjustment problems but there has been little empirical testing. The theoretical perspective that intra-family aggression disrupts parenting is plausible but systematic testing is needed before conclusions can be drawn regarding the importance of the role of parenting in mediating the association between intra-family aggression and children's adjustment. Testing this hypothesis requires increased sophistication in statistical approaches.

In addition, there are a number of methodological problems which have hindered past research. Since the effects of both parental alcohol consumption and depression have been well-documented, these factors need to be included in analyses to achieve a more complete understanding of the impact that intra-family aggression has on children's adjustment. In the same respect, it is necessary to control for the effects of other possible confounding factors (i.e., demographic variables, family size).

Empirically testing the mechanisms that potentially account for the relationship between exposure to intra-family aggression and children's adjustment difficulties would contribute significantly to the present state of knowledge in this area of research. Understanding the processes underlying the association between children's observations of intra-family aggression and adjustment difficulties has clinical utility as it may suggest areas that are accessible and responsive points of intervention. This information may help clinicians develop effective treatment and prevention efforts to reduce the risk to vulnerable children.

CHAPTER 3

METHOD

Purpose and Objectives of the Study

The purpose of this study was to examine the processes underlying children's responses to witnessing physical aggression in their families. The study tested the hypothesis that intra-family aggression affects children through two mechanisms. First, witnessing intra-family aggression affects children through observational learning and modeling of aggressive behaviour. Second, intra-family aggression affects children because intra-family aggression impacts on parent's ability to parent responsively which ultimately affects children's adjustment.

The primary objective of this study was to use structural equation modeling to test the hypothesis that exposure to physically aggressive behaviour in the family affects children's adjustment through these two mechanisms.

There were three secondary objectives:

(1) to determine whether there were differential effects for preschool, young school-age, and older school-age children,

(2) to determine whether gender influences children's responses to witnessing interparental aggression, and

(3) to determine if there were differences depending on whether maternal or child reports of parenting responsiveness and children's adjustment were used.

It was hypothesized that intra-family aggression would impact on children's adjustment through two mechanisms. Children's exposure to intra-family aggression would result in children behaving more aggressively using physical and indirect forms of aggression. Further, it was hypothesized that intra-family aggression would impact on maternal responsiveness which in turn would affect children's adjustment. It was anticipated that lower levels of maternal responsiveness would result in children using more physical aggression, indirect aggression, and showing more internalizing behaviours but less prosocial behaviours since this measures social competence. It was anticipated that boys would use more physical aggression and girls would use more indirect forms of aggression. Internalizing behaviours and prosocial behaviours were expected to be higher in girls as a result of socialization

practices common in North American society. It was further hypothesized that the youngest age group would have the strongest effects for aggressive and internalizing behaviours. Prosocial behaviours were not expected to be strong in this particular age group because the emergence of prosocial behaviours only typically emerges by this age in children from functional home environments (Zahn-Waxler & Radke-Yarrow, 1982).

Research Design

This study was designed to analyze data from the first wave of the National Longitudinal Survey of Children and Youth (NLSCY), a survey conducted by Statistics Canada to collect information on child development and well-being. Data for the first wave of the twenty year survey was collected from November 1994 to June 1995. The survey includes information concerning the child, the parent, and the family environment.

Target Population, Inclusions, and Exclusions

The target population for the NLSCY for Cycle 1 consisted of Canadian children from newborn to 11 years of age. In total, information was collected from 22,831 children. Children who had been living in institutions for over six months (e.g. hospitals, residential child-welfare facilities) and aboriginal children living on reserves were excluded. These exclusions represent approximately 0.5% of the target population. The same panel of children will be interviewed every two years until adulthood (up to twenty years).

Sampling Strategy

The NLSCY survey used a multi-stage stratified sample design with households as the sampling unit. Sampled households came from three different components (i.e., Main Component, Integrated Component, and Territories Component) drawn from four different sampling frames (i.e., source of subjects).

Main Component

The Labour Force Survey (LFS), which used a multi-stage stratified sample design, served as the basis of the household sample for the NLSCY (Statistics Canada, 1997). The survey was used to identify potential households with children since only 26% of Canadian households in the ten provinces have children under 11 years of age. A total of 12,900

households were selected for the sample for the main component. The LFS excludes children living in the Yukon or the Northwest Territories, children living in institutions, as well as children living on Indian Reserves.

Integrated Component

The NLSCY was integrated with the National Population Health Survey (NPHS; Statistics Canada, 1995), another national longitudinal survey designed to collect information on the physical and mental health of the Canadian population including children. The NPHS was also based on the LFS; however, a new sample was selected instead of using households already participating in the survey.

The NLSCY and the NPHS are integrated, meaning that common data for children (under 11 years of age) were collected from both the NLSCY and the NPHS children's sample, and used in the NLSCY. In a certain portion of the NPHS household sample, one member was chosen at random. If this person was a child under 11 years of age, the household was considered a part of the integrated sample, the NLSCY interview was administered to that household, otherwise the NPHS was administered.

A portion of the sample and the content of the two surveys were integrated for all provinces except Quebec (Statistics Canada, 1997). The households in Quebec, included in the NPHS sample, were obtained from a sampling frame that was constructed for the Enquête sociale et de santé conducted by Santé Québec in 1992 to 1993.

Territories Component

The Territories component was introduced to compensate for excluding individuals living in the Yukon and the Territories in the main component. The sample for the Territories component was drawn from the population of private occupied dwellings. The Yukon sample excludes institutions and unorganized areas while the Northwest Territories excludes households in very remote areas and very small communities. The Territories component for the NLSCY was fully integrated with the NPHS.

Sampling was based on the LFS frame but chosen specifically for the NPHS. One member of each household was chosen at random. For households with children under 11 years of age, the NLSCY was administered for children living in the household and one

person was selected for the NPHS. To lessen respondent burden, the content of both surveys was reduced and all information was collected through paper questionnaires rather than computer assisted interviewing.

The Territories component, though, is not included in the first release of data from Statistics Canada. Consequently, all analyses in this study are based on data from children living in the ten provinces (i.e., the main and integrated components).

NLSCY Sample

In total, 15,579 households were selected to participate in the survey. Of these, 13,439 households agreed to participate which is a response rate of 86.3%. Once households were selected, one child aged newborn to 11 years of age was randomly selected from each household. Then other children, up to a maximum of four children, were also randomly selected from the same economic family in the same household. The NLSCY defined an economic family as all family members related by blood, marriage, common-law relationship, or adoption. Foster children were considered part of the economic family.

In total, 22,831 children aged newborn to 11 years participated in the survey. Of these children, there was complete information for 97.1% of the children and partial information for 1.3% of the children. For 1.6% of these children there was non-response for all key items. The interviews ranged in length depending on the number of children in the family. On average, they were approximately two hours long for the household. Parents provided the information on their children. For children aged 10 to 11, questionnaires were also completed by the children themselves.

Sample for this Study

The sample for this study was derived from the 14,226 children in the survey that were between 4 and 11 years old, a subset of the total sample of children who participated. Three exclusion criteria were used. First, children were excluded if fathers responded to the interview. The parent interviewed was the person who was most knowledgeable about the responding child, referred to as the Person Most Knowledgeable (PMK). For 91.3% of the responding children (i.e., 22,831), the PMK was the mother (89.9% of mothers were biological mothers, 1.4% of mothers were the step, adoptive, or foster mothers). Since it was possible that there was something systematically different about families where the father was

the person most knowledgeable about the child, these children were excluded. Second, children with foster mothers were excluded. Foster mothers were not asked to provide information on parenting and their relationships may or may not be long-term. Finally, children with long-term medical problems (i.e., cerebral palsy, heart conditions or disease, epilepsy, kidney conditions or disease, mental handicaps, and other long-term conditions) were excluded. This was done to eliminate alternate explanations for adjustment difficulties. The final sample was 12,144 children -- 85.4% of the total number of children who were between 4 and 11 years old. Of these, 3,246 were preschool children (i.e., 4 to 5 year olds), 5,977 were young school-age children (i.e., 6 to 9 year olds), and 2,921 were older school-age children (i.e., 10 to 11 year olds).

Case Weighting

In a probability sample, each respondent has an equal chance of being selected and each person in the sample "represents" other persons besides themselves that are not in the sample. Since the NLSCY was based upon an unequal probability of selection of respondents, case weights were used to ensure that the estimates were free from bias and meaningful.

Statistics Canada assigned a weight for each record to be used to calculate the number of individuals in the population represented by that record. The calculation of weights is different depending on the sampling frame from which they were selected. Four different sampling frames were used. The final weight is the product of several weights: the basic weight, the cluster sub-weight, the balancing factor for non-response, the rural-urban factor and the province-age-sex-ratio adjustment factor. In addition, six weight correction factors were used. For instance, there was a correction because some households were excluded at the time of sample selection because they had no children in the target age group but became eligible three months later when the data were actually collected. In order to take into account the families who were ineligible at the time of sampling but eligible at the time of data collection, adjustments were used. Adjustments were also made to the case weights to ensure that estimates agreed with the January 1995 demographic estimates of the population of children aged newborn to 11 years old.

When employed, the case weights account for different forms of over- and under-representation in the sample data. In other words, they ensure that estimates (i.e., means, medians, percentages) are representative of the survey population. However, Statistics Canada (1997) warned that the procedure built into many statistical programs to weight cases

produces estimates that are accurate with the exception of the variance estimates. In order to make the variances more meaningful, they advise users to use normalized weights. Normalized weights are calculated by dividing the weight factor by the average of the weight factor for the relevant group or subgroup of data so that the average weight equals one. Using this method, the sum of the rescaled weight (i.e., normalized weights) equals the sample size. This method results in estimates of variances, calculated using standard statistical packages, that are "more meaningful" and take into account the unequal probability of selection. However, because "the stratification and clustering of the sample's design are still not taken into account, the variance calculated in this way are likely to be underestimated" (Statistics Canada, 1997, p. 148). According to Statistics Canada personnel, the standard error of the mean is inaccurate when calculated with the Statistical Package for Social Sciences (SPSS) but all estimates of variances and covariances are accurate (Jeannette Bustros, personnel communication, September 10, 1997).

NLSCY Data

The longitudinal survey was designed to capture a holistic approach to child development. At the inception of the survey, consultation was conducted with an international multidisciplinary team of experts in child development. Input and advice concerning the selection of specific subject areas, priorities, and survey questions came from multiple sources: (1) the NLSCY expert advisory group of researchers in the area of child development and the social sciences, (2) federal departments, and (3) representatives from the provinces and territories responsible for child development.

Statistics Canada (1997) decided that some concepts would be measured most appropriately through the use of a scale rather than single questionnaire items. Scales were chosen that had been previously used in other studies where the psychometric properties of the measures were available with complete references (Statistics Canada, 1997). Modifications though, were sometimes made, either by adding new questions or altering some wording. Some scales had not been previously used on Canadian children or had only been used in small studies. Therefore, extensive evaluations were done by Statistics Canada to ensure that the psychometric properties were true for the NLSCY population.

The current study used scales to measure parental depression, parenting, and all measures of children's adjustment. In addition to the parent's reports of parenting and child behaviours, the older school-age children (i.e., 10 to 11 year olds) self-completed

questionnaires which also included the use of scales to measure their perception of parenting behaviours and their own behaviour. A discussion of the validation of the scale data is necessary before proceeding because the procedures used in validating the scales were common for all scales (Statistics Canada, 1997).

Validation of the NLSCY Data

There were three major steps in the analyses of all scale data (Statistics Canada, 1997). First, the sample of respondents for each scale was randomly divided into two half-samples to determine whether both samples yielded consistent results. Sample size differs depending on the scale used. Second, factor analysis using principal components method was conducted on each half sample to determine the factors inherent in each scale. Because the scales yield ordinal data, a variant of Fisher's optimal scaling technique was first used to transform the ordinal data into interval data so that a factor analysis could be done. Third, the factorial structure and loadings were compared across both sub-samples and were used to determine what items "loaded" onto each factor. Finally, reliability measures were then produced using Cronbach's alpha coefficient, a measure of the internal consistency of items within each factor. In most instances, alpha provides a conservative estimate of a score's reliability (Nunnally, 1978). These analyses were conducted using SAS software. In this study, reliability was estimated for each subgroup using the parent's reports (i.e., preschool, young school-age, and older school-age children) and the older school-age children who completed their own questionnaires. All estimates of reliability in the current study were calculated using SPSS software.

Scale scores were calculated based on the identified factor structure by summing the values for individual items in each factor. For most scales, a score of zero represents the absence of a problem. Some variables with missing data had been set to a non-response code (i.e., refusal, don't know, not stated). When the number of items with a non-response code was less than a certain threshold, usually set at 10%, the value was imputed by Statistics Canada before the score was calculated.[2] The procedure used to impute missing values was a routine available in SAS (i.e., PRINQUAL) that determines which of the possible values for an item was the most plausible for an individual in view of his/her response profile, the response profiles of others in the sample, and the number of factors included in the analysis.

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[2] Imputation is a process of assigning plausible values to fill in missing or inconsistent items.

Imputation flags appear on all variables that have been imputed. Statistics Canada also imputed values for items missing in the children's self-completed questionnaires but these values were not available in the public use data file.

Analyses of the Parenting Scale and the Child Behaviour Scale used normalized weighted data. In addition, the Parental Nurturance and the Feelings and Behaviour Scale completed by the older school-age children (i.e., 10 to 11 year olds) used normalized weighted data. The individual's statistical weight was normalized by dividing his/her caseweight by the average weight for all individuals. Analysis of the Depression Scale was based on unweighted data because the unit of analysis for this scale was the PMK but the child was the unit of analysis for the survey. Therefore, the factor structure as well as the reliability for the Depression Scale was based on unweighted data.

NLSCY Scales

Depression Scale

The Depression Scale measures the frequency and occurrence of symptoms associated with depression in the public at large. The scale is an abbreviated version of the Center for Epidemiological Studies Depression Scale developed by L. S. Radloff (1977) of the National Institute of Mental Health in the United States. The shorter version was modified by Dr. M. Boyle of the Chedoke-McMaster Hospital of McMaster University (Statistics Canada, 1997).

This instrument consists of 12 items inquiring how often the person felt or behaved a certain way (e.g., depressed, unhappy, lonely, hopeless) in the past week. Responses were coded on a four point response category with 1 = rarely or none of the time (less than one day), 2 = some or a little of the time (1 - 2 days), 3 = occasionally or a moderate amount of the time (3 - 4 days), and 4 = most or all of the time (5 - 7 days a week). The value for each item was reduced by one in order for the lowest value to be zero. Three items with negative loadings were reverse scored. The total depression score ranges from 0 to 36 with high scores indicating the presence of depressive symptoms. Validation of this scale was based on the responses of 13,140 PMK's.[3] Cronbach's alpha coefficient was 0.82. In the current analyses,

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[3] Weighted data could not be used since the survey weights were for the children, not the parents.

Cronbach's alpha coefficient was 0.81 for mothers of preschool children, 0.82 for mothers of young school-age children, and 0.84 for mothers of older school-age children.

Parenting Scale

The Parenting Scale is a self-report questionnaire to assess parenting behaviours. The scale, proposed by Dr. M. Boyle at Chedoke-McMaster Hospital, is based on the work of Dr. Ken Dodge of Vanderbilt University and is an adaptation of Strayhorn and Weidman's Parent Practices Scale. The instrument measures respondent's patterns of parenting interactions using three subscales: Positive Interaction, Hostile/Ineffective, and Consistent Parenting. Each subscale consists of a series of items to measure each concept. The scale was validated using a sample of 18,135 individuals. For the total sample of children aged 2 to 11 years of age (for which this scale is applicable), data were imputed for 12 items. For these 12 items, the number of imputations varied between 1 and 16. In total, 91 values were imputed.

The Positive Interaction Subscale was used in this study. The subscale includes five items: "How often do you praise (child) by saying something like: Good for you or what a nice thing you did!" or "That's good going!", "How often do you and he/she talk or play with each other, focusing attention on each other for five minutes or more, just for fun?", "How often do you and he/she laugh together?", "How often do you do something special with him/her that he/she enjoys?", "How often do you play sports, hobbies, or games with him/her?" Responses were coded: 1 = never, 2 = about once a week or less, 3 = a few times a week, 4 = one or two times a day, 5 = many times each day. Higher scores indicate more responsive interactions. Validation of the scale was based on 18,135 children aged 2 to 11 year of age. Cronbach's alpha coefficient for the Positive Interaction Subscale was 0.81 for children aged 2 to 11 years of age. In this study, Cronbach alpha coefficient was 0.76 for preschool children, 0.73 for young school-age children, and 0.72 for older school-age children.

My Parents and Me Scale (Children's Reports)

My Parents and Me was designed to measure 10 and 11 year old children's perceptions of their parent's parenting behaviour and to complement the parenting scale completed by the parent. The scale, used in the Western Australia Child Health Survey, has three subscales: Parental Nurturance, Rejection, and Monitoring. The total score varies from 0 to 15, a high score indicating a high degree of parental nurturance.

The subscale includes five items: "My parents (or step parents or foster parents) - Smile at me", "Praise me", "Make sure I know I am appreciated", "Speak of the good things I do", and "Seem proud of the things I do." Responses were coded: 1 = never, 2 = sometimes, 3 = often, and 4 = very often. Validation of this scale was based on 2,921 children and followed the same procedures previously described. Imputation was done for all items but these values were not available in the public use data file. Cronbach's alpha coefficient was reported as 0.77. In the sample of older school-age children who met the inclusion criteria for this study, Cronbach's alpha coefficient was 0.77.

Behaviour Scale

The Behaviour Scale assesses several aspects of behaviour for children over two years of age. This scale, completed by parents, is composed of six subscales: Hyperactivity-Inattention, Property Offense, Anxiety, Physical Aggression-Conduct Disorder, Indirect Aggression, Emotional Disorder-Anxiety, and Prosocial Behaviour. The four latter scales were used in these analyses. Validation of the Behaviour Scale was based on 14,226 children aged 4 to 11 years of age. Data were imputed for 26 items. For these 26 items, the number of imputations varied between 1 and 159. A total of 363 values were imputed.

The Physical Aggression-Conduct Disorder Subscale measures physically aggressive behaviours using six items derived from the Ontario Child Health Study and the Montreal Longitudinal Survey. Items include: "Gets into many fights", "When another child accidentally hurts him/her (such as bumping into him/her), assumes that the other child meant to do it, and then reacts with anger and fighting?", "Physically attacks people?", "Threatens people?", "Is cruel, bullies or is mean to others?", "Kicks, bites, hits other children." Responses were coded on a three point response category with: 1 = never or not true, 2 = sometimes or somewhat true, 3 = often or very true. This scale is an index of behavioural pathology. While high scores indicate more behavioural problems, lower scores do not necessarily indicate more competence. Cronbach's alpha coefficient, calculated using normalized weighted data, was reported as 0.77 for children aged 2 to 11 years of age. In this study, Cronbach's alpha was 0.75 for preschool children, 0.78 for young school-age children, 0.75 for older school-age children.

The Indirect Aggression Subscale measures aggression using indirect forms of expression. The five items were provided by Lagerspetz, Bjorkvist, and Peltonen of Finland. Items include: "When mad at someone, tries to get others to dislike that person?", "When

mad at someone, becomes friends with another as revenge?", "When mad at someone, says bad things behind the other's back?", "When mad at someone, says to others: let's not be with him/her?", "When mad at someone, tells the other one's secret to a third person?" Responses were coded: 1 = never or not true, 2 = sometimes or somewhat true, 3 = often or very true. In the 2 to 11 year old sample, Cronbach's alpha for this subscale was reported as 0.78 calculated using normalized weighted data. In this study, Cronbach's alpha was 0.73, 0.79, and 0.79 for the preschool children, the young school-age children, and the older school-age children, respectively.

The Emotional Disorder-Anxiety Subscale was used to measure children's internalizing behaviours. The subscale includes eight items derived from the Ontario Child Health Study. Items include: "Seems to be unhappy, sad, or depressed?", "Is not as happy as other children?", "Is too fearful or anxious?", "Is worried?", "Cries a lot?", "Appears miserable, unhappy, tearful, or distressed?", "Is nervous, high-strung or tense?", "Has trouble enjoying him/herself?" Responses were coded: 1 = never or not true, 2 = sometimes or somewhat true, 3 = often or very true. This subscale is also an index of behavioural pathology. Cronbach's alpha coefficient for this subscale was 0.79 calculated using normalized weighted data. In the current study, Cronbach's alpha coefficient was 0.72 for preschool children, 0.78 for young school-age children, and 0.82 for older school-age children.

The Prosocial Behaviour Subscale measures behaviours that are considered socially desirable and demonstrate competence in children. This subscale includes ten items, six items derived from the Montreal Longitudinal Survey and four items derived from a scale devised by K. Weir and G. Duveen. Items include: "Shows sympathy to someone who has made a mistake?", "Will try to help someone who has been hurt?", "Volunteers to help clean up a mess someone else has made?" "If there is a quarrel or dispute, will try to stop it?" "Offers to help other children (friend, brother or sister) who are having difficulty with a task?", "Comforts a child (friend, brother or sister) who is crying or upset?", "Spontaneously helps to pick up objects which another child has dropped (eg., pencils, books, etc.)?", Will invite bystanders to join in a game?" "Helps other children (friends, brother or sister) who are feeling sick?", "Takes an opportunity to praise the work of less able children?" Responses were coded: 1 = never or not true, 2 = sometimes or somewhat true, 3 = often or very true. Cronbach's alpha was 0.82 calculated using normalized weighted data and based on 14,226 children in the 4 to 11 year age group. In the current study, the Cronbach's alpha was 0.83 for the preschool sample, 0.82 for the young school-age sample, and 0.80 for the older

school-age sample.

Feelings and Behaviours Scale (Children's Reports)

This scale was designed to assess 10 and 11 year old children's perception of their general behaviour and their engagement in risk-taking behaviours. The information replicates the information obtained by the parent. There are six subscales: Hyperactivity-Inattention, Difficult Behaviour, Physical Aggression-Conduct Disorder, Indirect Aggression, Anxiety-Emotional Disorder and Prosocial Behaviour. The latter four subscales were used in these analyses.

The Physical Aggression-Conduct Disorder Subscale measures children's perception of their use of physical aggression. The six items were derived from the Ontario Child Health Study and the Montreal Longitudinal Survey. The items include: "I get into many fights", "I assume, when another child accidentally hurts me (such as bumping into me) that the other child meant to do it, and then react with anger and fighting", "I physically attack people", "I threaten people", "I am cruel, bully or am mean to others", "I kick, bite, hit other children." Responses were coded: 1 = never or not true, 2 = sometimes or somewhat true, and 3 = often or very true. Some imputation was done for two of the items; however, imputed values were not retained in the released variables. The total score varies from 0 to 12, a high score indicating the presence of conduct disorder and physical aggression. Cronbach's alpha coefficient was 0.74 for all the 10 to 11 year old children who completed their own questionnaires and 0.74 for the sample used in this study.

The Indirect Aggression Subscale measures children's perception of their use of aggression using indirect forms of expression. The five items in this subscale were provided by Lagerspetz, Bjorkvist, and Peltonen of Finland and replicate the information obtained from the parent. Items include: "I try when I am mad at someone, to get others to dislike him/her", "When I am mad at someone, I become friends with another as revenge", "When mad at someone, I say bad things behind the other's back", "When mad at someone, I say to others: let's not be with him/her", "When mad at someone, I tell the other one's secrets to a third person." Responses were scored using the same response categories as above. The total score varies from 0 to 10, a high score indicating the presence of indirect aggression. Imputation was conducted for all items; however, these values were not retained in the released variables. Cronbach's alpha coefficient was reported as 0.73. It was the same for children used in these analyses.

The Anxiety and Emotional Disorder Subscale is composed of eight items derived from the Ontario Child Health Study and replicated the information obtained from the parent. Items include: "I am unhappy, sad or depressed", "I am not as happy as other children", "I am too fearful or anxious", "I am worried", "I cry a lot", "I feel miserable, unhappy, tearful, or distressed", "I am nervous, high-strung or tense", "I have trouble enjoying myself." Responses were scored using the same response categories as above. Imputation was done for all items but these values were not available in the public use data file. The total score varies from 0 to 16. A high score indicates the presence of behaviours associated with anxiety and emotional disorders. Cronbach's alpha coefficient was reported as 0.76. In the present analyses, Cronbach's alpha coefficient was 0.75.

The Prosocial Subscale was derived from items from the Ontario Child Health Study and the Montreal Longitudinal Survey. The items mirror the items asked of the parent. Items include: "I show sympathy to (feel sorry for) someone who has made a mistake", "I will try to help someone who has been hurt", "I volunteer to help clear up a mess someone else has made", "I will try, if there is an argument, to stop it", "I offer to help other children (friend, brother or sister) who are having difficulty with a task", "I comfort a child (friend, brother or sister) who is crying or upset", "I help pick up objects which another child has dropped (eg., pencils, books)", "I will invite bystanders to join in a game", "I help other children (friend, brother or sister) who are feeling sick", "I take the opportunity to show support for the work of children who can't do things as well as me." Responses were coded: 1 = never or not true, 2 = sometimes or somewhat true, 3 = often or very true. Imputation was done for all items; however, imputed values were not retained in the released variables. The total score varies from 0 to 20, a high score indicating the presence of prosocial behaviour. Internal consistency using Cronbach's alpha was reported as 0.77 which was the same for the sample used in these analyses.

Data Analysis

Analyses were conducted on an IBM-compatible computer using the Statistical Package for Social Sciences (SPSS) for MS Windows Release 8.0 (Norušis, 1998) for descriptive and inferential statistics. LISREL 7.2 (Jöreskog & Sörbom, 1989), a module of SPSS Windows 6.1, was used for all model estimations.

The first stage of analysis involved briefly describing the demographic and family characteristics of the sample using descriptive statistics. In addition, descriptive statistics were

used to identify the univariate characteristics of the indicators. Statistics Canada (1997) guidelines relating to the rounding of estimates, sample weighting for tabulation, estimation and variance calculation procedures, and sampling variability guidelines for release and/or publication were followed. The Approximate Sampling Variability Tables (C.V. Tables) provided by Statistics Canada were used. Although they are not exact coefficients of variation, personnel at Statistics Canada provided assurance that they are sufficiently accurate for these purposes (Jean Pignal, personnel communication, February, 20, 1999).

The hypothesized model was tested using structural equation modeling using LISREL which is an acronym for the analysis of ***li***near ***s***tructural ***rel***ations. Theoretical models imply a variance/covariance matrix. This matrix is referred to as the Sigma matrix (i.e., Σ).[4] LISREL tests the plausibility of hypothesized relationships within the theoretical model given the covariance structure of the observed data (i.e., referred to as the S matrix). In other words, the overall fit of the model tests the similarity of the model-implied covariance matrix (i.e., Σ matrix) with the observed variance/covariance data matrix (i.e., S matrix). Currently, there is a lack of consensus on the most appropriate fit index to use. There is, however, consensus that several methods of assessing model fit should be used and that no single measure should be relied on exclusively (Bollen & Long, 1993; Hayduk, 1996). In this study, the adequacy of the estimated model was assessed by examining the chi-square statistic, the Goodness of Fit Index (GFI), and the Adjusted Goodness of Fit Index (AGFI) (Hayduk, 1987).

The chi-square statistic is sensitive to sample size (Bollen & Long, 1993; Hayduk, 1987; 1996; Jöreskog & Sörbom, 1989; Jöreskog, 1993). It is often difficult to achieve a nonsignificant chi-square with large sample sizes and to truly assess the fit of a model with this index in studies with excessive statistical power. The GFI and the AGFI, adjusted for degrees of freedom, are unaffected by sample size (Jöreskog & Sörbom, 1989; Jöreskog, 1993). The fit of the model was further assessed by examining the components of the model such as the explained variance of the equations (i.e., R^2), the size of the effects and any signs in the output suggesting unusual results (Bollen & Long, 1993). Other LISREL output such as the standardized residuals and modification indices were also examined. Standardized

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[4] LISREL nomenclature requires the use of Greek names for variables and covariance matrices. To aid in understanding, conventional terms are used whenever possible and the LISREL terminology is placed immediately following in parenthesis.

residuals show the differences between the model-implied covariances (i.e., Σ matrix) and the covariance from the observed data (i.e., S matrix). Modification indices, which are measures associated with the derivatives of the fitting function, indicate where modifications can be made to improve the fit of the model (Hayduk, 1987). These indices were employed to identify sources of ill fit, as well as, a guide to improve the theory.

Maximum Likelihood (ML) estimation was used to estimate the structural coefficients (Hayduk, 1987). The significance of the structural coefficients were tested with the *t* statistic. A one-tailed test was used for coefficients where the direction of effects had been predicted. All other coefficients were tested using a two-tailed test. The covariance structure was created using listwise deletion of cases with missing data.

Ethical Considerations

Ethical approval was obtained from the Health Research Ethics Administration Board of the University of Alberta prior to initiating the study. The proposed study analyzed a Statistics Canada data set that is available for public use. Statistics Canada provides a public use micro data file to any researcher affiliated with a university that is part of the Data Liberation Initiative. The public use data file contains no identifying characteristics. Moreover, numerous measures had been taken to safeguard the identity of individual survey respondents. Measures taken in this survey were particularly stringent because of the fact that it is a longitudinal survey and it contains information on both children and families. For instance, numerous variables have been suppressed (e.g., child's birth date, country of birth, religion, ethnicity, exact date of data collection). Some variables were provided only in aggregated form (e.g., mother's age, highest level of education attained, family income) and other variables were altered by capping them at an upper end (e.g., number of children in the family is capped at four). These measures make it impossible to identify individuals/families. Since it is not at all possible to link individuals or families with any data; the anonymity of respondents is protected.

CHAPTER 4

THE CAUSAL MODEL

Specification of the Model

The Conceptual Model

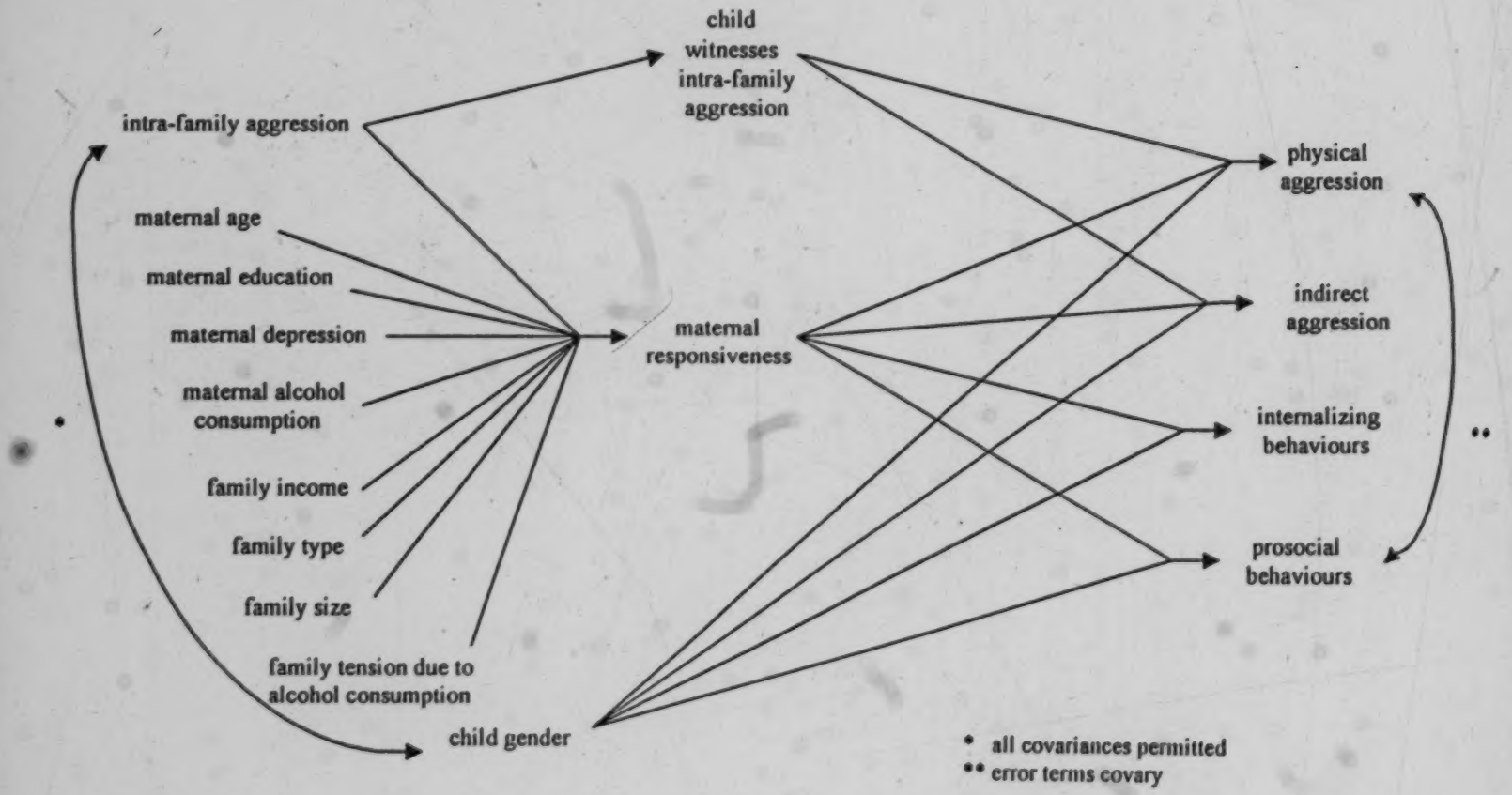
The conceptual model is diagrammatically represented in Figure 1. The literature reviewed and summarized in Chapter 2 provided the conceptual basis for identifying the concepts in the model. The complexity of the family environment and the interrelatedness of many pertinent variables demanded their inclusion in the model. However, despite the number of concepts in the model, it is still parsimonious since there are few structural coefficients to estimate because of constraints implied by the model (i.e., everything is not allowed to influence everything else).

The model hypothesized that intra-family aggression affects children through two pathways. First, aggression in the family results in children witnessing or observing the aggression which affects children through the modeling of aggressive behaviour. Children observing aggression then incorporate aggressive responses in their own behavioural repertoire and this influences their behavioural expressions. Consequently, witnessing aggression results in children using more externalizing behaviours (i.e., both physical and indirect aggression).

Second, intra-family aggression affects children because intra-family aggression impacts on parent's ability to provide warm, responsive parenting which ultimately affects all aspects of children's adjustment and social competence. It was anticipated that lower levels of maternal responsiveness would result in children using more physical and indirect aggression, and showing more internalizing behaviours but less prosocial behaviours since this measures children's social competence.

The model includes a number of background factors. These include demographic variables such as the maternal age, maternal education, family type (i.e., one or two parent families), family income, and family size. Other background factors include maternal alcohol consumption, maternal depression, and family tension related to alcohol consumption. All these background variables were hypothesized to exert their effect on children's adjustment

Figure 1: Initial Model: Processes Underlying Children's Responses to Witnessing Physical Aggression in their Families



through maternal responsiveness. In other words, no direct effects from these variables on children's adjustment were anticipated; their effects were channelled through maternal responsiveness. Finally, gender was included in the model because responses were expected to vary as a function of the child's gender. Boys were hypothesized to use more direct forms of aggression while girls were hypothesized to use more indirect forms of aggression. It was also anticipated that girls would have more internalizing and prosocial behaviours.

The model is fully recursive. This model presumes that intra-family aggression affects children through parenting and not the reciprocal. Understandably, children's behaviour does impact on mothers' behaviour, as interactions have indeed been shown to be reciprocal (Grych & Fincham, 1990). Although children's behaviour, especially overtly aggressive behaviour, may also influence mothers' behaviour (i.e., reciprocal effect), the purpose of this research was to understand how family/parent variables influence child variables. The logic underlying this decision was influenced by O'Leary and Emery (1984) who succinctly pointed out that the probability of having a problem child given the existence of marital distress was greater than the probability of experiencing marital distress given the presence of a child's problem behaviour, and improvement of a child's problem behaviour does not seem to result in the alleviation of marital problems. Rutter (1994) also stated that "there seems little doubt that there are true child effects on parents, but it is much more questionable whether this accounts for the association between marital conflict or family discord and conduct disorder in offspring" (p. 178). There is also a matter of clinical significance. Regardless of the direction of causal effects, children are still likely to need intervention strategies that address their problems. Improvement in children's behaviour is not likely to have a measurable change in parental behaviour if the underlying problem is aggression in the family context. A significant change in the family environment (i.e., elimination of physical aggression) though is likely to have a critical impact on children's behaviour. Consequently, reciprocal effects were not included in this initial stage of model development. The diagnostics incorporated in the LISREL analysis were checked with each estimation to determine whether reciprocal effects were needed to improve the model.

The model includes 16 latent concepts - 10 exogenous concepts and 6 endogenous concepts. Exogenous concepts, referred to as ksi's (ξ), are caused by factors outside the model while endogenous concepts, referred to as eta's (η), are explained (caused) by other variables in the model. Of the 10 exogenous concepts, 5 concepts relate to the family (i.e., intra-family aggression, tension in the family due to alcohol consumption, family income, family type, family size), 4 concepts relate to the mother (i.e., maternal age, maternal

education, maternal depression, maternal alcohol consumption). The last concept relates to the child (i.e., child gender). All of the exogenous concepts were permitted to covary. There are no error terms associated with these concepts. They are introduced only as causes of other concepts. The model does not attempt to explain the fluctuations in or background covariances among the exogenous concepts.

Of the six endogenous variables, one concept relates to the mother (i.e., maternal responsiveness), all others relate to the child. The endogenous concepts that relate to the child include child witnesses intra-family aggression, physical aggression, indirect aggression, internalizing behaviours, and prosocial behaviours. Each endogenous concept has an associated error term which acknowledges that all of the variance in the concept is not expected to be explained. The error terms associated with the four child adjustment outcomes were permitted to covary suggesting a nonorthogonal relationship (i.e., correlation) among the unaccounted for dimensions of children's adjustment. Although this approach to modeling is nontraditional, LISREL permits correlated measurement error to be specified and is a particularly useful approach when it is suspected that causal forces outside of those modeled may be acting similarly on certain variables (Hayduk, 1987). Permitting the error terms to covary acknowledges that sources other than the concepts specified in the model may influence these outcomes contributing to their source of error. This is quite likely to occur for any number of factors (i.e., exposure to violence in the media, peer influences) but seems especially likely since a measure of paternal responsiveness was not included in the model.

The same conceptual model was estimated separately five times. Three estimations were conducted; one estimation for each of the developmental groups: preschool children (i.e., 4 to 5 year olds), young school-age children (i.e., 6 to 9 year olds), and older school-age children (i.e., 10 to 11 year olds). These estimations were done to examine how age influenced children's responses to witnessing intra-family aggression. In each of these estimations, the data used were parental reports of both parent and child variables. These estimations are discussed in Chapter 5, 6, and 7, respectively. In the fourth estimation, estimates were obtained using both parent's and children's reports of parental responsiveness and children's behavioural adjustment. This estimation was conducted to examine whether there were differences in the model estimation when both parent's and children's reports were used. Only the older school-age children (i.e., 10 and 11 years old) completed questionnaires about parental responsiveness and their own behaviour that replicated the information provided by parents. Therefore, the fourth model, discussed in Chapter 8, included only the older school-age children. The fifth estimation procedure was conducted as a methodological

inquiry of the data since structural equation modeling assists in estimating reliability and validity (Bollen & Long, 1993). This estimation, conducted with the preschool sample, is discussed in Chapter 9. For ease of discussion, the models are referred to in numerical order (i.e., Model I through Model V), however this does not imply different conceptual models rather different estimations of the same model to accomplish all the study objectives.

Definitions of the Exogenous Concepts

The following section describes each exogenous concept used in the model. The meaning of each concept remains consistent for Models I through V.

Maternal age (ξ_1) refers to the number of years the mother has lived.

Maternal education (ξ_2) refers to the highest level of formal education that the mother has obtained.

Maternal depression (ξ_3) refers to symptoms associated with depression.

Maternal alcohol consumption (ξ_4) refers to the mother's reports of consumption of alcoholic beverages such as wine, liquor, or beer.

Family income (ξ_5) refers to the total level of household income from wages and salaries, income from self-employment, worker's compensation, unemployment insurance, social assistance, and other sources.

Family type (ξ_6) refers to whether the child lives in a single-parent or two-parent family. There is no differentiation as to whether two-parent families are intact families, blended, or step-parent families.

Family size (ξ_7) refers to the total number of children under 17 year of age who live in the family.

Tension in the family due to alcohol consumption (ξ_8) refers to tension within the family as a result of any family member's alcohol consumption.

Child gender (ξ_9) refers to the sex of the child.

Intra-family aggression (ξ_{10}) refers to any family member's use of physically aggressive behaviour to resolve conflicts.

Definitions of the Endogenous Concepts

The following section describes the endogenous concepts used in the model. The meaning of each concept remains consistent for Models I through V.

Child witnessing intra-family physical aggression (η_1) refers to the child's witnessing of physically aggressive acts by adults or teen-age children in the family.

Maternal responsiveness (η_2) refers to that aspect of parenting behaviour that demonstrates warmth and responsiveness to the child.

Physical aggression (η_3) refers to the child's use of aggressive behaviour that is direct in nature. Aggression is a form of acting out behaviour, usually reflecting under-control. It is expressed overtly such as harming others through physical means. Examples include: pushing, shoving, or hitting another individual.

Indirect aggression (η_4) refers to the use of aggressive behaviour that is indirect in nature. It is subtle, manipulative behaviour that is designed to hurt another individual. It involves harming others through purposeful manipulation such as hurting someone by excluding them from activities, telling another person's secrets, or gossiping.

Internalizing behaviours (η_5) refers to behaviours that are over-controlled, anxious and inhibited. They are associated with emotional disorders such as anxiety and depression.

Prosocial behaviours (η_6) refers to voluntary actions that are intended to help or benefit another individual. Prosocial behaviours are defined in terms of their intended consequences for others; they are performed voluntarily rather than under duress (Eisenberg, 1982; Eisenberg, Losoya, & Guthrie, 1997). These behaviours demonstrate social competence in children. Examples include helping behaviours, showing empathy, and kindness toward others.

The Measurement Model

Intra-family aggression is not directly measured in the model. It is a phantom concept (Hayduk, 1996). The specification of the phantom concept is discussed in further detail in the section on model specification. All other concepts in the model are measured. The indicators used to measure each concept vary for Model 1 through V. Consequently, the measurement structure of each model, including the appraised measurement error, will be discussed separately with each model.

Covariance Matrices

Five different covariances matrices were created (Appendix B). In each case, the covariance matrices were created using both listwise and pairwise deletion of missing cases. There were only minor differences between the two matrices. Missing data occurred randomly throughout the variables in all groups. There was no one variable in particular that was affected more notably than others which would indicate a potential selection bias. The matrices created using listwise deletion were chosen to be inputted into the analyses for several reasons. There was little reason to suspect that there was a selection bias. Statistics Canada had already taken steps to optimize the data (i.e., the majority of missing values were already imputed). In addition, the listwise deletion resulted in the loss of less than 10% of cases. Given that the sample size for each model estimation is large, using listwise deletion of missing data was deemed a conservative approach. Finally, Hayduk (1987) warns that the mathematics underlying the calculation of maximum likelihood estimates assumes that the covariance matrix is created using data from each individual for each variable included in the matrix that will be analyzed.

All covariance matrices were created with weighted data using SPSS.[5] While the usual approach is to use PRELIS 1.20, a data summarization and preprocessor program that accompanies the LISREL program (Jöreskog & Sörbom, 1989), PRELIS does not support the use of non-integer weights. All weights in the NLSCY data sets were non-integer. Consequently, a correlation matrix was first created and then converted to a covariance

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[5] The covariance matrix was calculated as:

$$\mathrm{Cov}(XY) = \sum_i \sum_j (x_i - \mu_x)\,(y_j - \mu_y)\,p(x_i, y_j)$$

matrix.[6] After observations for missing values were eliminated, the covariance matrix for the preschool sample was based on 3,014 children, the young school-age sample was based on 5,553 children, and the older school-age sample was based on 2,654 children for analyses using parental reports and 2,174 children[7] for analyses using children's own reports.

6

Several structural equation methodologists (Jöreskog & Sörbom, 1989, West, Finch, & Curran, 1995) recommend the use of a correlation matrix, using polychoric correlations when variables are measured on an ordinal scale. This would be a superior approach only if there was reason to believe that the variables were truly normally distributed in the population and that the use of arbitrary cut points poorly defined had caused the non-normal distribution. There is little reason to believe that the data is truly normally distributed in the population. Further, Hayduk (1987) maintains that the suggestion is only appropriate if a correlation matrix is used for the analysis rather than a covariance matrix.

7 Although imputation had been conducted on the missing data from the children's own reports, imputed values were not available in the public use data file.

CHAPTER 5

MODEL I: PRESCHOOL CHILDREN

Characteristics of the Preschool Sample

Of the 3,246 preschool children, 3,014 children had complete responses. This represents 640,562 Canadian children. Fifty-four percent of the children were 4 years old. There were slightly more boys (50.5%) in the sample than girls. Eighty-five percent of the children lived in two-parent families. Children lived in families that ranged from the lowest income category to the highest; however, almost 68% of children lived in families with incomes classified as middle or upper middle.

Of the preschool children, 92.9% had "never" witnessed physical aggression in their families, 5.0% had witnessed physical aggression on a "seldom" basis, 2.0% had witnessed aggression "sometimes" and 0.1% had witnessed physical aggression "often". A total of 7.0% of children had witnessed some degree of physical aggression in their families.

The Measurement Model

The full model including the measurement structure for Model I is specified in Figure 2 and mathematically represented in Appendix C. Each latent concept in the model was measured by a single indicator. The following section describes the indicators used to measure each concept.

The Indicators for the Exogenous Concepts

Maternal age (ξ_1) was measured by the indicator *maternal age* (x_1). The indicator was coded: 1 = 15 to 24 years, 2 = 25 to 29 years, 3 = 30 to 34 years, 4 = 35 to 39 years, 5 = 40 years and over [ADMPD06D].[8] Although age in years was preferred, this variable was suppressed in the public use file to guard against potentially identifying the respondent.

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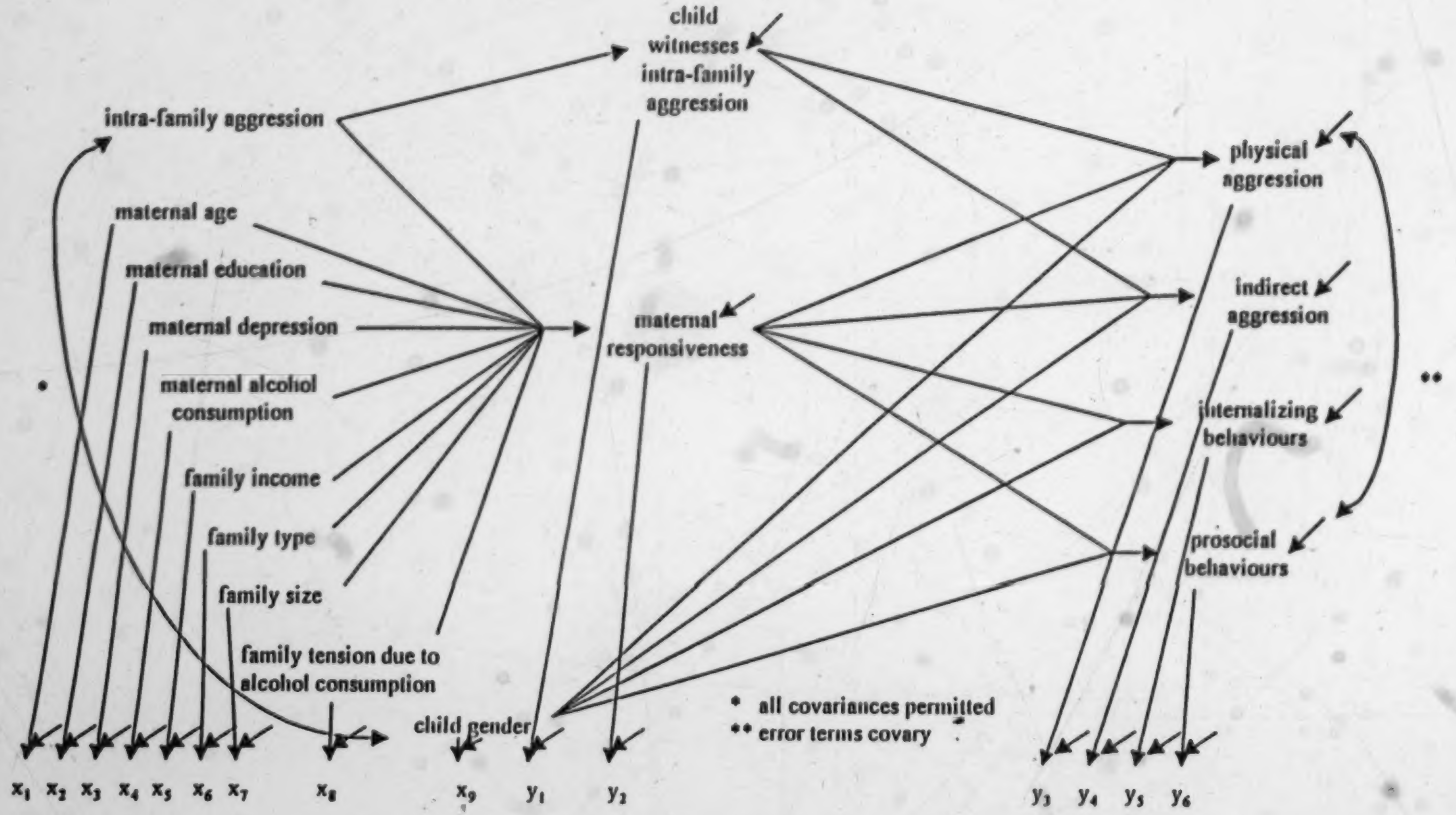
[8] All mnemonics and variables in square brackets refer to the variable name in the NLSCY data set.

Figure 2: Measurement Model I, II, and III: Preschool, Young School-Age, and Older School-Age Children



Maternal education (ξ_2) was measured by a derived variable created by Statistics Canada from six questions concerning the PMK'S highest level of education [AEDPS02]. This was the only information on education that was available for public use. The indicator, *maternal education* (x_2), therefore only contains crude categories of the PMK's highest level of educational attainment. Responses were coded: 1 = less than secondary, 2 = secondary school graduation, 3 = beyond high school, 4 = college or university.

Maternal depression (ξ_3) was measured by the indicator *maternal depression* (x_3). The indicator was composed of the summed score of the Depression Scale [ADPPS01].

Maternal alcohol consumption (ξ_4) was derived from responses to two items in the questionnaire. Mothers responded to the following question, "During the past 12 months, have you had a drink of beer, wine, liquor or any other alcoholic beverage [AHLPQ04]?" Respondents who answered positively were then prompted to answer "During the past 12 months, how often did you drink alcoholic beverages [AHLPQ05]?" Responses were coded: 1 = every day, 2 = 4 to 6 times a week, 3 = 2 to 3 times a week, 4 = once a week, 5 = 2 to 3 times a month, and 6 = once a month. Respondents who did not drink (i.e., answered no to the first question) were assigned a code of "0" in the derived variable, *maternal drinking* (x_4), to represent "no drinking in the last 12 months." Responses to the second questionnaire item were reverse scored (i.e. 1 = 6, 2 = 5, 3 = 4, 4 = 3, 5 = 2, 6 = 1) so that higher numbers reflected more alcohol consumption. These responses were moved to the derived variable.

Family income (ξ_5) was measured by the indicator *family income* (x_5). Respondents were asked to provide information on sources of household income from wages and salaries, income from self-employment, worker's compensation, unemployment insurance, social assistance and other sources. This information, along with the number of family members, was used to form a measure of income adequacy. This measures the adequacy of household income in relation to the number of persons in the household [AINHD07]. Categories are "lowest", "lower middle", "middle", "upper middle" and "highest." For example, a classification of middle income is given when the household income is $15,000 to $29,999 for one or two persons, or $20,000 to $39,999 for three to four persons, or $30,000 to $59,999 for five or more persons. These categories were used by the National Population Health Survey (Statistics Canada, 1995).

Family type (ξ_6) was measured by the indicator *family type* (x_6). Responses were coded: 1 = two-parent, 2 = one-parent only, 3 = does not live with a parent [ADMCD04].

The latter category does not apply since foster children were excluded from the analyses. The indicator was recoded: 0 = two-parent, 1 = one-parent.

Family size (ξ_7) was measured by the indicator *family size* (x_7). Respondents reported the total number of children aged 0 to 17 years old living in the family including the target child [ADMHD07]. Teenage parents who were under 17 were not included in this count. For confidentiality reasons, this variable was capped at four in the public-use micro data file; however, this only applied to seven households in the survey.

Tension in the family due to alcohol consumption (ξ_8) was measured by mothers' responses to: "Drinking is a source of tension or disagreement in our family" [AFNHQ01M]. Responses were coded: 1 = strongly agree, 2 = agree, 3 = disagree, 4 = strongly disagree. There was no differentiation made regarding who in the family had the drinking problem, just that the drinking was a source of family tension. This question was drawn from the follow-up to the Ontario Child Health Study (Statistics Canada, 1997). In the indicator *family tension* (x_8), responses were reverse scored for ease of interpretation. Higher number reflect more family tension.

Child gender (ξ_9) was measured by the indicator *child gender* (x_9). Responses were reported as F = female and M = male [AMMCQ02]. This variable was recoded in numeric form (i.e., 0 = F, 1 = M).

Intra-family aggression (ξ_{10}) is a phantom concept in the model. It was not directly measured because the survey question only asked "how often does the child see adults or teenagers in your house physically fighting, hitting or otherwise trying to hurt others?" It is entirely reasonable, however, to infer that if a child "sees" adults or teenagers physically fighting, hitting or otherwise trying to hurt others, it is because physical aggression actually exists in the family. This is discussed in greater detail in the section on fixed coefficients, scaling, and reliability.

The Indicators for the Endogenous Concepts

Child witnesses intra-family aggression (η_1) was assessed using mother's response to the question "How often does he/she see adults or teenagers in your house physically fighting, hitting, or otherwise trying to hurt others?" [APRCQ28]. Responses were coded: 1 = often, 2 = sometimes, 3 = seldom, 4 = never. The responses were reverse scored in the indicator

child witnesses (y_1) so that higher numbers reflect witnessing aggression more frequently.

Maternal responsiveness (η_2) was measured by the indicator *maternal responsiveness* (y_2) using the total score of the Positive Interaction Subscale of the Parenting Scale [APRCS03].

Physical aggression (η_3) was measured by the indicator *physical aggression* (y_3) using the total score of the Physical Aggression-Conduct Disorder Subscale of the Behaviour Scale [ABECS09].

Indirect aggression (η_4) was measured by the indicator *indirect aggression* (y_4) using the summative score of the Indirect Aggression Subscale of the Behaviour Scale [ABECS10].

Internalizing behaviours (η_5) was measured by the indicator *internalizing behaviours* (y_5) using the total score of the Emotional Disorder-Anxiety Subscale of the Behaviour Scale [ABECS08].

Prosocial behaviours (η_6) was measured by the indicator *prosocial behaviours* (y_6) using the total score of the Prosocial Behaviour Subscale of the Behaviour Scale [ABECS07].

Fixed Coefficients, Scaling, and Reliability

The structural coefficient ($\gamma_{1,10}$) from intra-family aggression to child witnesses intra-family aggression was fixed at 1.0 and the variance in the phi matrix corresponding to intra-family aggression (i.e., $\Phi_{10,10}$) was manipulated to account for approximately 70% of the variance in child witnesses intra-family aggression. This specification was an assertion about the variability of children witnessing intra-family aggression. This assertion assumes that 30% of the variance in witnessing is unexplained by the aggression that is occurring in the family. That is, the 30% error accounts for any over-or under-estimation. These strategies were necessary to facilitate estimation because intra-family aggression was not directly measured in the survey. The survey only inquired about the frequency of a child's exposure to aggressive acts between family members. Although exposure to aggression is related to the actual frequency of physical aggression in family members' behaviour, it is not necessarily the same (i.e., there may be occurrences of physical aggression which the child does not witness). More importantly, in a causal model it is important that the causal sequencing is correct (i.e.,

the pathways flow in the correct sequence of events). A child "witnessing aggression" cannot be expected to "cause", "alter" or "change" the mother's responsiveness in any way. Instead, maternal responsiveness is altered because the aggression that is occurring in the family environment contributes to an environment that is not conducive to responsive parenting. This is one of the theoretical perspectives being tested in the model. In addition, the occurrence of aggression in the family results in the child witnessing such events. Consequently, the phantom variable "intra-family aggression"precedes "child witnesses intra-family aggression" and allows for meaningful interpretation of the estimates.

Each concept other than the phantom concept was scaled by specifying a value of one (i.e., fixing lambda [λ] at 1.0) to link the concept to its indicator. This sets the scale on which the values of the underlying concepts are measured linking unit changes in the concept to unit changes in the indicator (Hayduk, 1987).

In addition, each concept was adjusted for measurement unreliability. A strong feature of structural equation modeling is its ability to handle measurement error through the measurement portion of the model (Boyd, Frey, & Aaronson, 1988; Hayduk, 1987). Measurement error can result from any number of factors such as poorly constructed questionnaire items, coding or data entry errors, or response bias. To account for this random source of error, a portion of the variance of each indicator was assigned to error (i.e., theta deltas and theta epsilons were fixed). This strategy allows the researcher some control over the meaning of each concept (Hayduk, 1987). The proportion of error variance assigned to each indicator was determined differently depending on whether the concept was measured using the total score of a scale or a single questionnaire item. For all concepts measured using the total score of a scale, the same procedure was used to estimate the portion of variance assigned to error. This amount was calculated based on the unreliability of the measure which was derived from the reliability estimates calculated for each sample used in the analyses (i.e., error = 1 - α) (Hayduk, 1987). An additional 0.5% was added to account for the occasional data entry error. For example, Cronbach's alpha coefficient for the Depression Scale for mothers of 4 to 5 year old children was 0.81. Therefore, unreliability equals 0.19. Consequently, the error variance was 0.195 of the variance of the indicator (i.e., 19.5%). The percent of error variance and actual amount assigned to error for the indicators measured using the total scores of scales are presented in Table 1.

Table 1

Percent Error Variance in Indicators Measured Using Scale Data for Model I, II, and III

Indicator	4- 5 years		6 - 9 years		10 - 11 years	
	%	Actual Variance Fixed	%	Actual Variance Fixed	%	Actual Variance Fixed
Maternal depression (x_1)	19.5	5.1741	18.5	5.7281	16.5	5.7667
Maternal responsiveness (y_2)	24.5	1.8941	27.5	2.2362	28.5	2.2459
Physical aggression (y_3)	25.5	0.9400	22.5	0.7829	25.5	0.7607
Indirect aggression (y_4)	27.5	0.4967	21.5	0.6723	21.5	0.6687
Internalizing behaviours (y_5)	28.5	1.3315	22.5	1.4886	18.5	1.4254
Prosocial behaviours (y_6)	17.5	2.8902	18.5	2.6480	20.5	2.5879

The criteria used to fix measurement error for all other indicators varied. The actual percentage of variance assigned to error in each indicator is presented in Table 2.

Maternal age. A very conservative amount of error was assigned to the indicator for maternal age. Although age is a variable that is often underestimated due to social pressure to appear younger, it is unlikely that individuals would do so when responding to a federal government survey. Moreover, respondents provided their day, month, and year of birth and the person's age was then calculated. This method of determining age results in more reliable measures. Consequently, one percent was assigned to error for the indicator for maternal age.

Maternal education. One percent error variance was assigned to the indicator for maternal education. The survey was conducted with considerable care taken to collect accurate information from respondents. Further, the variable used in this analysis was derived based on the responses to a total of six questions concerning the respondent's level of education. Consequently, a conservative amount of error variance was assigned primarily to account for the possibility that some credentials do not neatly fit into categories particularly when respondents immigrate from other countries.

Table 2

Percent Error Variance in Indicators Measured Using Survey Items for Model I, II, and III

Indicator	Percent Error Variance	Actual Variance Fixed		
		4 - 5 years	6 - 9 years	10 - 11 years
Maternal age (x_1)	1.0	0.0101	0.0088	0.0070
Maternal education (x_2)	1.0	0.0114	0.0116	0.0123
Maternal drinking (x_4)	5.0	0.1384	0.1462	0.1613
Family income (x_5)	2.0	0.0201	0.0197	0.0189
Family type (x_6)	0.5	0.0006	0.0006	0.0007
Family size (x_7)	3.0	0.0201	0.0215	0.0210
Family tension (x_8)	5.0	0.0226	0.0207	0.0211
Child gender (x_9)	0.5	0.0013	0.0013	0.0013
Child witnesses (y_1)	10.0	0.0131	0.0148	0.0197

Maternal alcohol consumption. The indicator for maternal alcohol consumption was assigned a moderate amount of error variance because social desirability may cause some individuals to under-report their level of alcohol consumption. Consequently, five percent error variance was assigned to this indicator.

Family income. A modest amount of error variance was assigned to the indicator for family income. Since the survey was conducted by the federal government it was believed that individuals would report their income more accurately than in other surveys. More importantly, considerable care was taken by the survey methodologists to ensure that this variable took into account all potential sources of income such as income from self-employment, worker's compensation, unemployment insurance, social assistance as well as other sources and not just income from wages and salaries. Nevertheless, income is a variable that tends to be under-reported and there are often errors related to the likelihood that people will round their income to the nearest five or ten thousand dollars (i.e., $61,000 would probably be reported as $60,000). Income is generally more prone to non-response that other demographical information. When this occurred, the value for income was imputed. Consequently, the error variance associated with the indicator for income was specified to

equal two percent of the variance in the indicator.

Family type. A very small amount of error was assigned to the indicator for family type. It is not likely that individuals would mistake their one-parent families for two-parent families or vice versa. An error variance of 0.5% should account for errors related to the occasional data entry or coding mistake.

Family size. Reports concerning the number of children in the family should closely match the actual number of children in the family. However, since the variable has been capped at four in the public-use data file, this number may be underestimated in some instances. Consequently, a modest three percent was assigned to error for this indicator.

Tension in the family due to alcohol consumption. Reports of the degree of tension in the family due to alcohol consumption may well be under-reported due to respondents desire to respond in a social desirable manner or due to recall bias. Five percent error variance was assigned to the indicator to account for these possibilities.

Child gender. Child's gender should correspond almost perfectly to the child's actual gender. A very conservative error variance (0.5%) was assigned to this variable to account for an occasional data entry error. Even this amount is likely overestimated given the care with which the survey was conducted and the fact that all data is double entered and verified.

Child witnessing intra-family physical aggression. The error for this indicator was given more variance than others due to some ambiguity in the wording of the question. Respondents were asked how often does the child see adults or teenagers in your house physically fighting, hitting, or otherwise trying to hurt others? Some respondents may have difficultly identifying the most appropriate response since there were two individuals to consider (i.e., adults or teenagers). In addition, the question is sensitive in nature. Social desirability may cause some people to under-report the incidence of aggressive behaviour in their family. Consequently, the error variance in this indicator was fixed at 10%.

Univariate Description of the Indicators in Model I

The univariate description of the indicators in Model I are presented in Table 3. There are clear departures from univariate normality in several variables. The indicators for *maternal depression* (x_3), *family tension* (x_8), *child witnesses* (y_1), *physical aggression* (y_3),

Table 3

Univariate Description of the Indicators in Model I: Preschool Children[a]

Indicator	Range	Mean (SD)	Skewness	Kurtosis
Maternal age (x_1)	1 - 5	3.19 (1.01)	-0.06	-0.46
Maternal education (x_2)	1 - 4	2.90 (1.07)	-0.52	-1.02
Maternal depression (x_3)	0 - 34	4.65 (5.15)	1.83	3.73
Maternal drinking (x_4)	0 - 7	1.96 (1.66)	0.63	-0.57
Family income (x_5)	1 - 5	3.41 (1.00)	-0.25	-0.48
Family type (x_6)	0 - 1	0.15 (0.36)	N/A	N/A
Family size (x_7)	1 - 4	2.28 (0.82)	0.44	-0.21
Family tension (x_8)	1 - 4	1.47 (0.67)	1.52	2.44
Child gender (x_9)	0 - 1	0.51 (0.50)	N/A	N/A
Child witnesses (y_1)	1 - 4	1.09 (0.36)	4.26	19.02
Maternal responsiveness (y_2)	3 - 20	14.62 (2.78)	-0.48	0.28
Physical aggression (y_3)	0 - 12	1.56 (1.92)	1.63	2.95
Indirect aggression (y_4)	0 - 9	0.78 (1.34)	2.11	4.71
Internalizing behaviours (y_5)	0 - 14	2.06 (2.16)	1.20	1.22
Prosocial behaviours (y_6)	0 - 20	11.23 (4.06)	-0.10	-0.37

[a] n = 3014

and *indirect aggression* (y_4), show positive skewness and kurtosis in the data. In particular, *child witnesses* (y_1) has marked skewness and kurtosis. This was anticipated since it was not expected that children's witnessing of aggression in their families was a variable that was normally distributed in the population. Examination of the skewness and kurtosis of the univariate distribution provides only an initial check on multivariate normality. However, since there were observed variables that deviate substantially from univariate normality, then the multivariate distribution cannot be multi-normal (West et al., 1995).

There are certain assumptions that have to be met in order to use structural equation modeling. Ideally, variables should be measured on a continuous scale and be normally distributed in the population. Both of these assumptions were violated in these analyses. Several researchers, however, have examined the robustness of structural equation modeling

with non-normal data. Hu, Bentler, and Kano (1992) examined several estimation procedures in Monte Carlo studies using samples that varied from 150 to 5000 cases when the assumption of normality and independence of factors were violated. They concluded that the Maximum Likelihood (ML) estimation technique, the estimator that was used in these analyses, provided estimates within an acceptable margin of error with samples of 2,500 and greater. Muthén and Kaplan (1985) reported that although their chi-square values were larger and estimated standard errors lower when using ML, their parameter estimates were consistent, regardless of the estimation method used on skewed data based on categorical variables. They concluded that the ML method was "quite robust" especially when sample sizes were not small. West and colleagues (1995) also maintained that there is greater risk that chi-square values will be large and estimated standard errors untrustworthy with non-normal data, but it is more problematic when sample sizes are small and variables are differentially skewed.

In earlier work, Jöreskog and Sörbom (1989) advised against the use of LISREL methodology with ordinal data under conditions of non-normality and recommended the use of Weighted Least Squares (WLS). More recently, they have conceded that previous Monte Carlo studies have not resulted in conclusive evidence as to when it is necessary to use WLS rather than ML. With the intention of demonstrating the superiority of WLS over ML, Jöreskog and Sörbom (1996) generated variables measured on different scales that were normally and non-normally distributed and analyzed the covariance structure using several different estimation methods such as ML, WLS, Generalized Least Squares (GLS), Unweighted Least Squares (ULS) and Diagonally Weighted Least Squares (DWLS). The model fit well regardless of the method used to estimate the model and the parameter estimates varied little between methods. However, the chi-square values and the standard errors were larger when WLS was used. Jöreskog and Sörbom (1996) concluded that parameter estimates produced by ULS, DWLS, GLS and ML may be underestimated when variables deviate from multivariate normality. On the other hand, Muthén and Kaplan (1985) reported that their parameter estimates were consistent regardless of the method used despite the fact that their data were categorical and non-normal. Their chi-square value, however, was larger than expected and the standard error small. The issue seems to be a contentious one and additional tests of robustness are needed to resolve the issue unequivocally.

Maximum Likelihood was the method chosen to estimate the parameters in this study as the sample size in each analyses was large. Ideally, alternate estimation techniques, the Asymptotically Distribution Free (ADF), which has no distribution assumptions, and the

Satorra-Bentler Scaled χ^2 (Satorra & Bentler, 1988) which is an adjustment for non-normality that can be applied to the chi-square test statistic following any of the estimation procedures could have been used. Both these techniques require the use of EQS, a program which the researcher was not familiar with. More importantly, as Hayduk (1987) pointed out the use of ML may result in larger chi-square values but it is a conservative approach if used with the conventional alpha level (i.e., 0.05).

Identification

The estimation process was first attempted allowing the computer program (i.e., LISREL) to supply the initial starting values for the parameters. The program was unable to start the iterations because the model-implied covariance matrix (i.e., Sigma matrix [Σ]) was not positive definite (i.e., there was no inverse). This is not uncommon in models where the number of latent concepts is greater than the number of observed indicators (Jöreskog & Sörbom, 1989). Consequently, start values for the parameters were specified to begin the modeling process. The parameter NS was also included in the syntax to instruct "the program to use the steepest descent method to improve the starting point before the real minimization of the fit function begins" (Jöreskog & Sörbom, 1989, p. 129). Start values were specified for the variances of the exogenous concepts (i.e., diagonal elements in the phi matrix [Φ]) using approximations of the variance of the observed indicators (Hayduk, 1996). In addition, user-specified start values were provided for the endogenous error variables (i.e., diagonal elements in the psi matrix [Ψ]) which were equal to the variance of the indicators of the endogenous concepts times the portion estimated as unexplained variance. This procedure resulted in a model-implied covariance matrix [Σ] which was positive definite.

The matrix of structural coefficients for the exogenous variables (i.e., lambda [Λ_x]) had a rank less than its order indicating that there are linear dependencies in the data. Hence, there was no inverse for this matrix (Hayduk, 1987). This was anticipated since the model includes a phantom concept. There were no other warning signs in the output to signify that there were any problems with identification. The program required 14 iterations to find an acceptable solution. There were no other major problems encountered such as wildly unreasonable estimates of variances or standardized coefficients that exceeded the normal range (i.e., -1 to 1) or coefficient estimates high enough to signify collinearity problems. All of the partial derivatives for the free coefficients were zero which implies that the maximum of the likelihood function had been reached and the LISREL estimates were truly maximum likelihood (Hayduk, 1987). Hence, the estimates were assumed to be reasonable.

Model Estimation

The initial model, depicted in Figure 1, resulted in a statistically significant chi-square ($\chi^2 = 446.82$, df = 35, $p < 0.001$). This indicates that the model fit the data poorly and that the differences between the model-implied covariance matrix (Σ) and the covariance matrix generated from the data (S) were not small enough to be sampling fluctuations. Since the chi-square test, similar to other test statistics, is dependent on sample size, a model with implied covariances that differ only minutely from the observed covariances are likely to be rejected with a large enough sample size even if the theoretical explanations are entirely reasonable[9] (Bollen & Long, 1993; Browne & Cudeck, 1993; Hayduk, 1987). The Goodness of Fit Index (GFI) was 0.981 and the Adjusted Goodness of Fit (AGFI) was 0.936. These indices suggested that there was sufficient reason to pursue model modifications.

The output was examined to identify sources of ill fit. Almost 33% of the standardized residuals exceeded an absolute value of 1.96 suggesting that there were many discrepancies between the observed covariances and the model-implied covariances. In particular, there was concern because several diagonal elements had large residuals indicating that the model had difficulty explaining the variance of several endogenous concepts (i.e., maternal responsiveness, physical and indirect aggression). Further, the normal quantile plot (i.e., Q-Q plot) showed that the residuals were not normally distributed. However, no other particular patterning was apparent.

The standardized residual for the covariance between maternal depression and internalizing behaviours was 14.82. In addition, the modification index for the path from maternal depression to children's internalizing behaviours ($\gamma_{5,3}$) was quite large (i.e., 148.20). This index suggested that freeing this pathway would improve the model. The change was theoretically reasonable since research has shown that maternal depression is significantly associated with children's adjustment difficulties (Downey & Coyne, 1990). Although the original intent was simply to control for the effects of maternal depression on maternal responsiveness, it was apparent that this variable was exerting a direct influence on children's internalizing behaviours, not mediated through maternal responsiveness.

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[9] Given the same covariance structure with a sample size of 301, which is approximately 10% of the sample size in this analysis, the $\chi^2_{(df,33)} = 44.49$ with a probability of 0.13.

Model Modifications

The coefficient from maternal depression to children's internalizing behaviours ($\gamma_{5,3}$) was freed. This change resulted in a modest improvement to the model. The chi-square (χ^2) was now 289.95 with 44 degrees of freedom ($p < 0.001$). Although the significance level was still showing that the model did not fit the data,[10] the GFI was 0.988 and the AGFI was 0.956. This suggested that the model was approaching an acceptable fit. Hayduk (1996) maintains that an AGFI greater than 0.950 suggests that the model closely approximates reality. Given that there are many degrees of freedom in this model, and thus few estimated coefficients, there was sufficient reason to pursue making modifications that were theoretically justified. Based on the diagnostic information, further changes were required. The modification indices for the pathways from children's internalizing behaviours to physical aggression ($\beta_{3,5}$) and indirect aggression ($\beta_{4,5}$) was 38.878 and 33.478, respectively. This suggests that freeing these pathways and permitting directed effects between these endogenous concepts would further improve the fit of the model. The correlated error terms were insufficient to account for the covariances between the concepts. In essence, the modifications indices were suggesting that directed effects were required in addition to the error covariances. That is, there was a specific data recommendation. The modifications were undertaken and the model re-estimated; however, a borderline collinearity problem appeared between the error terms in the endogenous concepts that had been permitted to covary ($\psi_{3,5}$ and $\psi_{4,5}$) and the corresponding directed effects ($\beta_{3,5}$ and $\beta_{4,5}$). Because of the borderline collinearity problem, a choice had to be made between using the directed effects which were suggested by the diagnostics or pursuing the initial intent to permit only covariances between the error terms. Directed effects were chosen because of the recommendation made by the diagnostics. Although there was no known research to substantiate the recommended change, one of the strong advantages of using structural equation modeling is because the diagnostic capabilities permit researchers to improve on their theoretical formulations.

The two correlated error terms (i.e., $\psi_{3,5}$ and $\psi_{4,5}$) were removed and the model re-estimated.[11] These changes resulted in a modest improvement in model fit and removed the collinearity problems. The improved model fit confirmed that the choice of adding directed

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[10] Given the same covariance structure with a sample size of 301, the $\chi^2_{(df,34)} = 28.87$, $p = 0.717$.

[11] An alternate option would have been to use fixed small nonzero covariances to preserve the original estimated covariances.

effects over retaining the correlated error terms was reasonable. The revised model was more consistent with the data. The chi-square (χ^2) for the modified model was 198.46 (df, 34, $p < 0.001$)[12, 13] while the GFI was 0.992 and the AGFI was 0.970. However, there were still modification indices that suggested the model could be improved. In particular, the modification index for $\gamma_{3,7}$ was 43.70. This suggested that freeing the pathway from family size to physical aggression would further improve the model. Nevertheless, the model was not revised. Although the intent was to test the hypothesized model and to generate a model that fit the data better, it was decided a priori that a minimum number of changes would be made. Additional changes that incrementally improve model fit stand to capitalize on chance (Hayduk, 1987; Jöreskog, 1993). A conservative approach to modeling was desired. The information concerning the impact of family size on children's aggressive behaviours would be included as a suggestion for further research.

Maximum Likelihood Estimates for Modified Model I

The modified model is outlined in Figure 3. Coefficients that are statistically significant appear as solid lines while insignificant ones appear as broken lines. Table 4 includes the maximum likelihood estimates for the modified model. Standardized coefficients for the pathways are included to facilitate interpretation and comparison. Although the majority of the effects (77.3%) are statistically significant, most effects are weak or modest in size. The model explained 69.9% of the variance in children's witnessing aggression, but this was a function of the procedure used to estimate the model with the phantom variable. Together intra-family aggression and all the background variables accounted for 7.9% of the variance in maternal responsiveness. Of the background variables that were hypothesized to influence maternal responsiveness, maternal education, maternal depression, family size, and family tension due to alcohol consumption were statistically significant. Family income also influenced maternal responsiveness; however, the sign of the structural coefficient ($\gamma_{2,5} = -0.204$, $p < 0.01$) was opposite to what one would intuitively expect. Less income adequacy was associated with an increase in maternal responsiveness. All other coefficients were in the direction expected.

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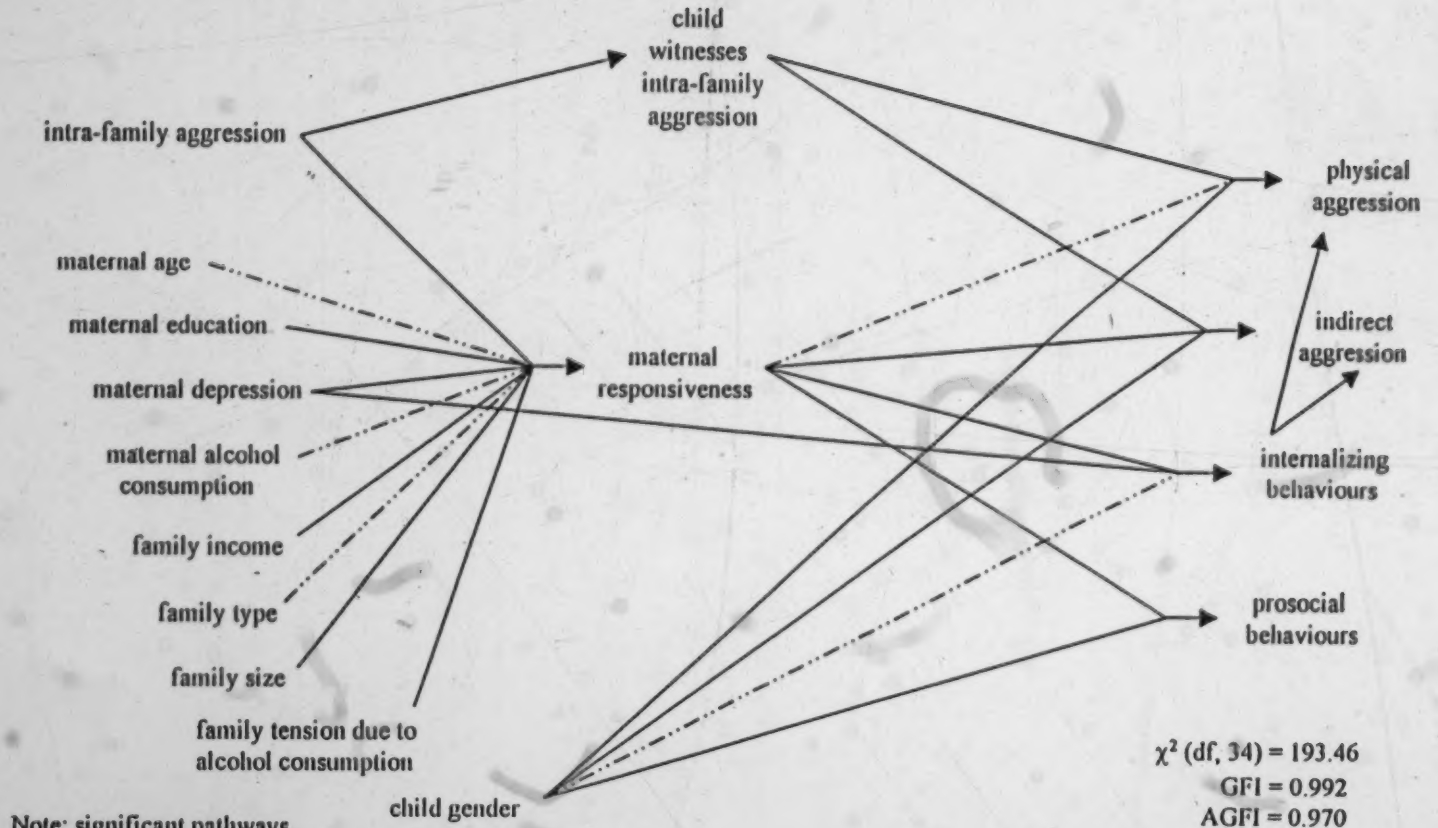
[12] Given the same covariance structure with a sample size of 301, the $\chi^2_{(df,34)} = 19.26$, $p = 0.980$.

[13] Degrees of freedom remained the same because two pathways were added but two pathways were deleted.

Figure 3: Modified Model I: Preschool Children



Note: significant pathways shown by solid lines

Table 4

Maximum Likelihood Estimates for the Effects in Modified Model I: Preschool Children[a]

Effect *To*	From	Unstandardized Effect	Standardized Effect	Explained Variance
Child witnesses intra-family aggression				69.9%
	Intra-family aggression	1.000[b]	0.836[b]	
Maternal responsiveness				7.9%
	Intra-family aggression	-0.653**	-0.078**	
	Maternal age	-0.041	-0.017	
	Maternal education	0.162**	0.071**	
	Maternal depression	-0.103***	-0.197***	
	Maternal alcohol consumption	-0.052	-0.035	
	Family income	-0.204**	-0.084**	
	Family type	-0.168	-0.025	
	Family size	-0.323***	-0.108***	
	Family tension due to alcohol	-0.241**	-0.066**	
Physical Aggression				25.5%
	Child witnesses intra-family aggression	0.533***	0.111***	
	Maternal responsiveness	-0.018	-0.027	
	Internalizing behaviours	0.421***	0.465***	
	Child gender	0.412***	0.124***	
Indirect aggression				15.1%
	Child witnesses intra-family aggression	0.236***	0.071***	
	Maternal responsiveness	-0.036**	-0.075**	
	Internalizing behaviours	0.220***	0.351***	
	Child gender	-0.098*	-0.043*	
Internalizing behaviours				16.9%
	Maternal responsiveness	-0.072***	-0.095***	
	Maternal depression	0.150***	0.379***	
	Child gender	-0.038	-0.010	

(Table 3 continued....)

Effect To	From	Unstandardized Effect	Standardized Effect	Explained Variance
Prosocial behaviours				12.6%
Maternal responsiveness		0.471***	0.309***	
Child gender		-1.309***	-0.177***	
Chi square				193.46
Degrees of freedom				34
Probability				0.000
GFI				0.992
AGFI				0.970

[a] $n = 3014$. [b] coefficient fixed.

*$p < 0.05$. **$p < 0.01$. ***$p < 0.001$.

Although the model showed an acceptable fit, the model only explained a small proportion of the variance in the child adjustment measures, the endogenous concepts that were of primary interest in this study. The model explained 25.5% of the variance in physical aggression, 15.1% of the variance in indirect aggression, 16.9% of the variance in internalizing behaviours, and 12.6% of the variance in prosocial behaviours.

Witnessing physical aggression in the family contributed to children's use of aggression. Children who witnessed more aggression behaved more aggressively using both physical and indirect forms of expression. For every unit increase in children's witnessing aggression (e.g., from "never" witnessing aggression to "seldom" witnessing), their use of physical aggression increased 0.533 units ($p < 0.001$) and indirect aggression increased 0.236 units ($p < 0.001$).

Physical aggression in the family resulted in less maternal responsiveness ($\gamma_{2,10} = -0.653$, $p < 0.01$). Maternal responsiveness, however, did not significantly influence the use of physical aggression in preschool children after controlling for all the background variables. It did however, significantly influence children's use of indirect aggression ($\beta_{4,2} = -0.036$, $p < 0.01$). Maternal responsiveness also indirectly influenced children's aggression by

contributing to children's internalizing behaviours. Less maternal responsiveness was associated with more internalizing behaviours in children ($\beta_{5,2}$ = -0.072, $p < 0.001$). The total effect[14] of maternal responsiveness (i.e., direct and indirect effect) on children's use of physical aggression was -0.048 ($p < 0.01$) and on children's use of indirect aggression was -0.052 ($p < 0.001$) (Table 5). Although both these effects were statistically significant, they were weak effects.

Maternal depression had a negative effect on maternal responsiveness ($\gamma_{2,3}$ = -0.103, $p < 0.001$). Less maternal responsiveness contributed to children's internalizing behaviours ($\gamma_{5,2}$ = -0.072, $p < 0.001$). Maternal depression also had a direct effect on children's internalizing behaviours. Children who lived with mothers who experienced more symptoms of depression were more sad, withdrawn, and depressed themselves. The direct effect of depression on children's internalizing behaviours ($\gamma_{5,3}$ = 0.150, $p < 0.001$) was over 21 times greater than the indirect effect mediated through maternal responsiveness. The total effect of depression on children's internalizing behaviours was 0.157 ($p < 0.001$).

Table 5

Direct, Indirect, and Total Effects In Model I: Preschool Children

Effect		Effect		
From	*To*	Direct	Indirect	Total
Maternal responsiveness	*Physical aggression*	-0.018	-0.030***	-0.048**
Maternal responsiveness	*Indirect aggression*	-0.036**	-0.016***	-0.052***
Maternal depression	*Internalizing behaviours*	0.150***	0.007***	0.157***

*$p < 0.05$. **$p < 0.01$. ***$p < 0.001$.

[14] The total effect is the sum of direct plus indirect effects. Indirect effects are calculated as the product of the basic direct effects (e.g., the total effect of maternal responsiveness on children's use of physical aggression is equal to: $\beta_{3,2} + [\beta_{3,2} \times \beta_{3,5}]$).

Children who were more sad, withdrawn, and depressed behaved more aggressively using both forms of aggression. For every unit increase in children's internalizing behaviours, their use of physical aggression increased by 0.421 units ($p < 0.001$) and indirect aggression increased by 0.220 units ($p < 0.001$).

Maternal responsiveness also had a direct effect on children's prosocial behaviours. For every unit increase in maternal responsiveness, children's use of prosocial behaviours increased 0.471 units ($p < 0.001$) when the background variables were held constant.

Gender influenced some responses in children. Boys used significantly more physical aggression ($\gamma_{3,9} = 0.412$, $p < 0.001$), less indirect aggression ($\gamma_{4,9} = -0.098$, $p < 0.05$), and were less socially competent ($\gamma_{6,9} = -1.309$, $p < 0.001$) than girls. There were no statistically significant gender effects in internalizing behaviours in the preschool sample.

In summary, as anticipated, children were negatively affected by witnessing physical aggression in their families. They were also affected because aggression in family disrupted maternal responsiveness which in turn influenced children's adjustment. The model fit the data reasonably well considering the size of the sample and it explained a modest portion of the variance in the adjustment of preschool children.

CHAPTER 6

MODEL II: YOUNG SCHOOL-AGE CHILDREN

Characteristics of the Young School-Age Sample

There were 5,977 children in the young school-age sample (i.e., 6 to 9 years old). The final sample size after listwise deletion of missing data was 5,553 children which represents 1,201,081 children. The sample was almost proportional in the various age groups; 24.9% of the children were 6 years old, 25.5% of the children were 7 years old, 25.2% of the children were 8 years old, and 24.4% of the children were 9 years old. The sample was approximately evenly split on gender (50.3% were boys). The vast majority of children (85.3%) lived in two-parent families. Sixty-seven percent of children lived in families with household incomes that were classified as middle or upper middle income.

The vast majority of these children (91.1%) had "never" witnessed physical aggression in their families. The remaining children had witnessed physical aggression on a "seldom" basis (6.9%), "sometimes" (1.8%), and "often" (0.2%).

The Measurement Model

The full model including the measurement structure for the young school-age children is the same model that was specified for the preschool sample. The model is depicted in Figure 2 and mathematically represented in Appendix C. The specification of the model for the young school-age sample (i.e., 6 to 9 year olds) replicates the specification of the model for the preschool sample. The same procedure was used to estimate the percent of variance that was assigned to error. The reliability estimates were used to estimate the percent of error for indicators that used scale data (Table 1). The same percent of variance was assigned to error for each indicator measured using individual survey items (Table 2). The actual amount of variance that was assigned to error differed in this sample since this depends on the variance of each indicator.

Univariate Description of the Indicators in Model II

The univariate description of the indicators in Model II is outlined in Table 6. In several of the observed variables, there were clear departures from univariate normality. The indicators *maternal depression* (x_3), *family tension* (x_8), *child witnesses* (y_1), *physical aggression* (y_3), *indirect aggression* (y_4), and *internalizing behaviours* (y_5) show positive skewness and kurtosis. Since these observed variables deviate substantially from univariate normality, the multivariate distribution is not normally distributed (West et al., 1995).

Table 6

Univariate Description of the Indicators in Model II: Young School-age Children[a]

Indicator	Range	Mean (SD)	Skewness	Kurtosis
Maternal age (x_1)	1 - 5	3.67 (0.94)	-0.24	-0.60
Maternal education (x_2)	1 - 4	2.82 (1.08)	-0.42	-1.11
Maternal depression (x_3)	0 - 35	4.72 (5.56)	2.02	4.94
Maternal drinking (x_4)	0 - 7	2.02 (1.71)	0.58	-0.65
Family income (x_5)	1 - 5	3.47 (0.99)	-0.18	-0.58
Family type (x_6)	0 - 1	0.15 (0.35)	N/A	N/A
Family size (x_7)	1 - 4	2.41 (0.85)	0.35	-0.48
Family tension (x_8)	1 - 4	1.46 (0.64)	1.36	1.83
Child gender (x_9)	0 - 1	0.50 (0.50)	N/A	N/A
Child witnesses (y_1)	1 - 4	1.11 (0.39)	3.87	16.22
Maternal responsiveness (y_2)	1 - 20	12.53 (2.85)	-0.12	-0.15
Physical aggression (y_3)	0 - 12	1.33 (1.87)	1.89	3.87
Indirect aggression (y_4)	0 - 10	1.31 (1.77)	1.56	2.31
Internalizing behaviours (y_5)	0 - 16	2.58 (2.57)	1.24	1.58
Prosocial behaviours (y_6)	0 - 20	12.68 (3.78)	-0.18	-0.39

[a] $n = 5553$

Identification

Starting values were provided so that the model-implied covariance matrix (i.e., Sigma matrix [Σ]) became positive definite. The same process of determining the start values was used as in the previous model. Other than the warning that the matrix of structural coefficients for the exogenous variables (i.e., [lambda [Λ_x]) did not have full column rank, which was expected because of the phantom concept, there were no warning signals in the output to suggest problems with identification. The program converged to an acceptable solution after 19 iterations. Partial derivatives for the free coefficients were zero implying that the maximum of the likelihood function had been reached and estimates were truly maximum likelihood (Hayduk, 1987). Estimates were therefore assumed to be reasonable.

Model Estimation

Estimation of the initial model for the young school-age sample resulted in a chi-square (χ^2) of 793.78 with 35 degrees of freedom and a probability less than 0.001. The GFI and the AGFI were 0.982 and 0.938, respectively. Forty residuals exceeded an absolute value of 1.96, an indication that there were many discrepancies between the population and the sample covariance matrix. In particular, the model had difficulty explaining the variance of three endogenous variables (i.e., maternal responsiveness, physical aggression, and indirect aggression). The largest standardized residual (20.43) was for the covariance between depression and internalizing behaviours. The normal quantile plot showed that the residuals were not normally distributed. In particular, there were many outliers indicating poorly fitted covariances. These problems were similar to those encountered in the initial estimation of Model I.

The modification index for the path from maternal depression to children's internalizing behaviours was excessively large ($\gamma_{3,3}$ = 283.07) suggesting that freeing this coefficient would improve model fit. This change was theoretically reasonable. Moreover, it was the same initial change that was undertaken in Model I.

Model Modifications

The coefficient from maternal depression to children's internalizing behaviours ($\gamma_{3,3}$) was freed. Although the change resulted in a substantial improvement to the model (χ^2 = 492.98, df = 34), the chi-square remained significant. However, the GFI was 0.989 and the

AGFI was 0.959. Examination of the standardized residuals revealed 40% still had a value greater than $\pm$ 1.96. In particular, the model was having difficulty explaining the variance of internalizing behaviours and the covariance between internalizing behaviours and physical and indirect aggression. The modification indices provided additional insight. Freeing the pathways from children's internalizing behaviours to physical aggression ($\beta_{3,5}$) and indirect aggression ($\beta_{4,5}$) would improve the fit of the model. This suggested revision was the same suggestion that was made by the diagnostics for Model I. The model was changed to free these coefficients. Similar to Model I, the two corresponding correlated errors terms ($\psi_{3,5}$ and $\psi_{4,5}$) had to be removed to eliminate a borderline collinearity problem. The modified model resulted in a chi-square of 327.90 (df, 34, $p < 0.001$) showing a modest improvement to the model. The GFI was 0.992 and the AGFI was 0.973. Similar to Model I, the modification index suggested that freeing the coefficient from family size to physical aggression would further improve the model. For reasons already discussed, this change was not undertaken.

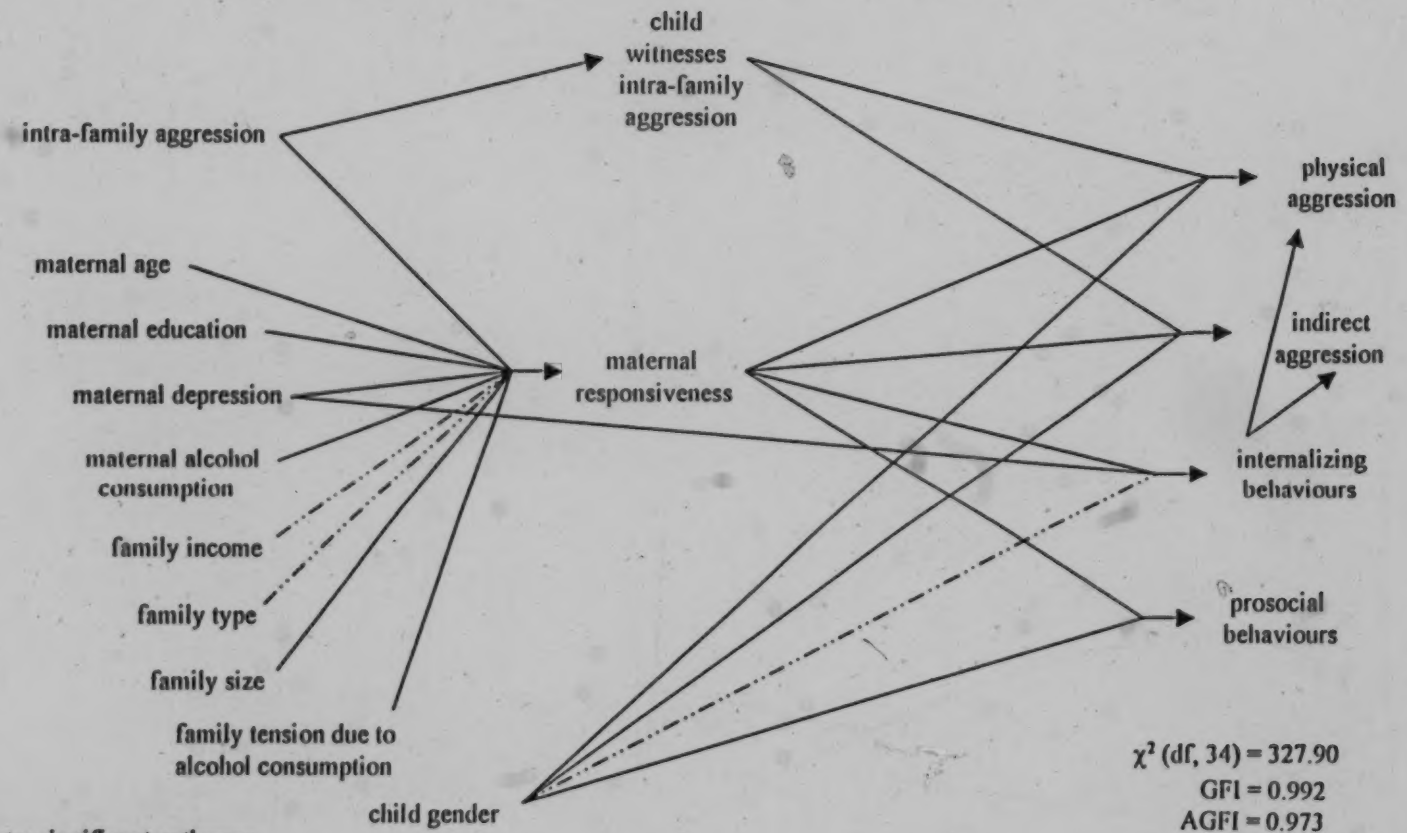
Maximum Likelihood Estimates for Modified Model II

The modified model is shown in Figure 4. Table 7 summarizes the maximum likelihood estimates for Model II. Of the hypothesized effects that were free to be estimated, 86.4% of the effects were statistically significant. The explained variances for the endogenous concepts in the model were: 8.4% of maternal responsiveness, 32.9% of physical aggression, 20.4% of indirect aggression, 15.0% of internalizing behaviours, and 18.9% of prosocial behaviours.

Aggression in the family negatively influenced maternal responsiveness ($\gamma_{2,10} = -0.534$, $p < 0.001$). Maternal responsiveness was also influenced by several background variables: maternal age ($\gamma_{2,1} = -0.214$, $p < 0.001$), maternal education ($\gamma_{2,2} = 0.170$, $p < 0.001$), maternal depression ($\gamma_{2,3} = -0.059$, $p < 0.001$), maternal alcohol consumption ($\gamma_{2,4} = -0.090$ $p < 0.001$), family size ($\gamma_{2,7} = -0.513$, $p < 0.001$), and family tension related to alcohol consumption ($\gamma_{2,8} = -0.417$, $p < 0.001$).

Children's witnessing aggression contributed to their use of physical and indirect aggression. For every unit increase in children's witnessing of aggression, their own aggressive behaviour increased by 0.343 units ($p < 0.001$) using physical forms of expression and by 0.239 units ($p < 0.001$) using indirect forms of expression. Maternal responsiveness significantly contributed to children's aggressive behaviour even after controlling for all the

Figure 4: Modified Model II: Young School-Age Children



Note: significant pathways shown by solid lines

Table 7

Maximum Likelihood Estimates for the Effects in Modified Model II: Young School-Age Children [a]

Effect *To*	From	Unstandardized Effect	Standardized Effect	Explained Variance
Child witnesses intra-family aggression				69.7%
	Intra-family aggression	1.000[b]	0.835[b]	
Maternal responsiveness				8.4%
	Intra-family aggression	-0.534***	-0.067***	
	Maternal age	-0.214***	-0.082***	
	Maternal education	0.170***	0.075***	
	Maternal depression	-0.059***	-0.122***	
	Maternal alcohol consumption	-0.090***	-0.062***	
	Family income	-0.018	-0.007	
	Family type	-0.065	-0.009	
	Family size	-0.513***	-0.176***	
	Family tension due to alcohol	-0.417***	-0.108***	
Physical Aggression				32.9%
	Child witnesses intra-family aggression	0.343***	0.076***	
	Maternal responsiveness	-0.025*	-0.037*	
	Internalizing behaviours	0.380***	0.524***	
	Child gender	0.599***	0.182***	
Indirect aggression				20.4%
	Child witnesses intra-family aggression	0.239***	0.056***	
	Maternal responsiveness	-0.060***	-0.093***	
	Internalizing behaviours	0.286***	0.413***	
	Child gender	-0.253***	-0.080***	
Internalizing behaviours				15.0%
	Maternal responsiveness	-0.103***	-0.111***	
	Maternal depression	0.160***	0.355***	
	Child gender	0.059	0.013	

(Table 7 continued....)

Effect *To* From	Unstandardized Effect	Standardized Effect	Explained Variance
Prosocial behaviours			18.9%
Maternal responsiveness	0.521***	0.371***	
Child gender	-1.559***	-0.228***	
Chi square			327.90
Degrees of freedom			34
Probability			0.000
GFI			0.992
AGFI			0.973

[a] $n = 5553$. [b] coefficient fixed.
*$p < 0.05$. **$p < 0.01$. ***$p < 0.001$.

background variables. Less maternal responsiveness was associated with an increase in children's use of physical aggression ($\beta_{3,2} = -0.025$, $p < 0.05$) and indirect aggression ($\beta_{4,2} = -0.060$, $p < 0.001$). Maternal responsiveness also contributed to children's internalizing behaviours. This variable was inversely associated with children's internalizing behaviours ($\beta_{5,2} = -0.103$, $p < 0.001$). The total effect of maternal responsiveness (i.e., direct and indirect effect) on children's use of physical aggression was -0.064 ($p < 0.001$) and -0.090 ($p < 0.001$) for indirect aggression (Table 8). Maternal responsiveness was also associated with an increase in prosocial behaviours ($\beta_{6,2} = 0.521$, $p < 0.001$).

Maternal depression had a direct effect on children's internalizing behaviours ($\gamma_{5,3} = 0.160$, $p < 0.001$). This effect, together with the indirect effect through maternal responsiveness, resulted in a total effect of 0.166 units ($p < 0.001$) on children's internalizing behaviours. An increase in internalizing behaviours was associated with an increase in physical aggression ($\beta_{3,5} = 0.380$, $p < 0.001$) and indirect aggression ($\beta_{4,5} = 0.286$, $p < 0.001$).

Gender influenced young school-age children's adjustment. Boys were significantly more physically aggressive ($\gamma_{3,9} = 0.599$, $p < 0.001$) but used less indirect forms of expression

Table 8

Direct, Indirect, and Total Effects In Model II: Young School-Age Children

Effect		Effect		
From	*To*	Direct	Indirect	Total
Maternal responsiveness	*Physical aggression*	-0.025*	-0.039***	-0.064***
	Indirect aggression	-0.060***	-0.030***	-0.090***
Maternal depression	*Internalizing behaviours*	0.160***	0.006***	0.166***

* $p < 0.05$. ** $p < 0.01$. *** $p < 0.001$.

($\gamma_{4,9} = -0.253$, $p < 0.001$) than girls. Boys were less socially competent ($\gamma_{5,9} = -1.559$, $p < 0.001$) than girls of this age. Gender did not significantly influence internalizing behaviours in young school-age children.

In summary, similar to the preschool sample, young school-age children were negatively affected by witnessing physical aggression in their families. They were also affected because aggression in the family disrupted maternal responsiveness which in turn had an impact on children's adjustment. The model fit the data reasonably well given that the analysis was based on a sample size in excess of 5000. A modest portion of the variance in young school-age children's outcomes was explained by the theoretical perspectives tested in this modeling exercise.

CHAPTER 7

MODEL III: OLDER SCHOOL-AGE CHILDREN

Characteristics of the Older School-Age Sample

There were 2,921 children in the older school-age sample (i.e., 10 to 11 years old) who met inclusion criteria for the analyses. Of these, 2,654 had complete responses using parental reports. The sample represents 604,007 Canadian children. There were more 10 year olds (52.5%) and slightly more boys (50.5%) in the sample. The majority of the children (84.4%) lived in two-parent families. Similar to the other samples, the majority (68.4%) lived in families classified in the middle or upper middle income category.

Ninety percent of the children in this sample had "never" witnessed physical aggression in their families. The remaining children witnessed some degree of physical aggression: 7.2% witnessed it on a "seldom" basis, 2.2% witnessed it "sometimes" and 0.6% witnessed it "often".

The Measurement Model

The conceptual model for the older school-age sample is the same model that was specified for the younger children. The specification of the model, depicted in Figure 2 and mathematically represented in Appendix C, replicates the models for the younger children. The only exception is the actual amount of variance that was assigned to error. However, the same rationale was used to fix a portion of the variance to error that was used in the previous models. The actual variance that was fixed as measurement error for the indicators are outlined in Tables 1 and 2.

Univariate Description of the Indicators in Model III

The univariate description of the indicators in Model III is outlined in Table 9. Similar to the data in the other samples, there were clear departures from univariate normality in several of the observed variables. There was positive skewness and kurtosis in *maternal depression* (x_3), *family tension* (x_4), *child witnesses* (y_1), *physical aggression* (y_3), *indirect aggression* (y_4), and *internalizing behaviours* (y_5). The multivariate distribution, therefore

Table 9

Univariate Description of the Indicators in Model III: Older School-age Children[a]

Indicator	Range	Mean (SD)	Skewness	Kurtosis
Maternal age (x_1)	1 - 5	4.02 (0.84)	-0.40	-0.64
Maternal education (x_2)	1 - 4	2.82 (1.11)	-0.43	-1.18
Maternal depression (x_3)	0 - 35	4.72 (5.91)	2.15	5.32
Maternal drinking (x_4)	0 - 7	2.04 (1.80)	0.68	-0.51
Family income (x_5)	1 - 5	3.52 (0.97)	-0.21	-0.54
Family type (x_6)	0 - 1	0.16 (0.36)	N/A	N/A
Family size (x_7)	1 - 4	2.41 (0.84)	0.35	-0.46
Family tension (x_8)	1 - 4	1.43 (0.65)	1.51	2.17
Child gender (x_9)	0 - 1	0.51 (0.50)	N/A	N/A
Child witnesses (y_1)	1 - 4	1.13 (0.44)	1.80	15.69
Maternal responsiveness (y_2)	1 - 20	11.52 (2.81)	0.03	-0.20
Physical aggression (y_3)	0 - 12	1.19 (1.73)	2.15	5.61
Indirect aggression (y_4)	0 - 10	1.38 (1.76)	1.58	2.85
Internalizing behaviours (y_5)	0 - 15	2.87 (2.78)	1.12	0.99
Prosocial behaviours (y_6)	0 - 20	13.26 (3.55)	-0.21	-0.33

[a] $n = 2654$

cannot be normally distributed.

Identification

In order to facilitate the estimation procedure, user-specified starting values were employed. The same process of determining the start values was used as in the previous models. This process resulted in a Sigma matrix [Σ] which had an inverse which is necessary for matrix calculations. The output provided only one warning: "Lambda [Λ_x] did not have full column rank". This is usual when phantom concepts are modeled. There were no other warning signals to suggest identification problems. The program converged after 18 iterations without any major problems. All the partial derivatives for the free coefficients were zero. This implies that the maximum of the likelihood function had been reached and estimates were reliable.

Model Estimation

The initial estimation resulted in a chi-square of 453.93 ($df = 35$, $p < 0.001$). The GFI was 0.979 and the AGFI was 0.927. Similar to the initial estimations with the younger children, there were many discrepancies between the population and the sample covariance matrix evident in the residuals. Thirty percent of residuals were greater than $\pm$ 1.96. This pattern suggests that more than random error was required to account for the differences between the model-implied and the observed covariances (Hayduk, 1987). Similar to the other initial estimations, the model had difficulty explaining the variance of maternal responsiveness and physical aggression; however, indirect aggression was not as problematic in this estimation. The largest standardized residual (14.79) was for the covariance between depression and internalizing behaviours. These problems were again similar to those encountered in the previous initial estimations.

The maximum modification index was 94.17 for the structural coefficient for the path from maternal depression to children's internalizing behaviours ($\gamma_{3,3}$). Though it was not as large as in the previous models, the same revision was necessary to improve the fit of the model for the older school-age sample.

Model Modifications

The model was modified to incorporate a direct effect from maternal depression to children's internalizing behaviours. This modification resulted in a chi-square of 350.72 ($df = 34$, $p < 0.001$). The GFI and the AGFI were 0.983 and 0.948, respectively. There were signs of ill fit. Thirty-three of the 130 standardized residuals exceeded an absolute value of $\pm$ 1.96. Although the normal quantile plot confirmed the many outlying residuals, there was no other patterning to help identify particular sources of ill fit. Examination of the modification indices again suggested the model fit would improve by freeing the coefficient from internalizing behaviours to physical and indirect aggression. These diagnostics were similar to both previous models. Both coefficients were freed ($\beta_{3,5}$ and $\beta_{4,5}$), and the two corresponding correlated errors terms removed ($\psi_{3,5}$ and $\psi_{4,5}$). These changes resulted in a modest improvement to the model ($\chi^2 = 193.39$, $df = 34$, $p < 0.001$). The GFI was 0.990 and the AGFI was 0.966. Similar to the models for the younger children, the modification index suggested that the fit would improve with the addition of a direct path from family size to physical aggression. The same recommendation in three models suggests that the relationship between family size and children's use of physical aggression likely represents a true

true population effect. Nevertheless, to maintain conformity between models, the change was not undertaken.

Maximum Likelihood Estimates for Modified Model III

The modified model is shown in Figure 5. A summary of the maximum likelihood estimates for Model III are outlined in Table 10. Over 77% of the effects were statistically significant. The model explained a modest percentage of the variance of the endogenous concepts in the model. The model explained 9.2% of the variance in maternal responsiveness, 33.6% of the variance in physical aggression, 26.9% of the variance in indirect aggression, 17.4% of the variance in internalizing behaviours, and 17.7% of the variance in prosocial behaviours.

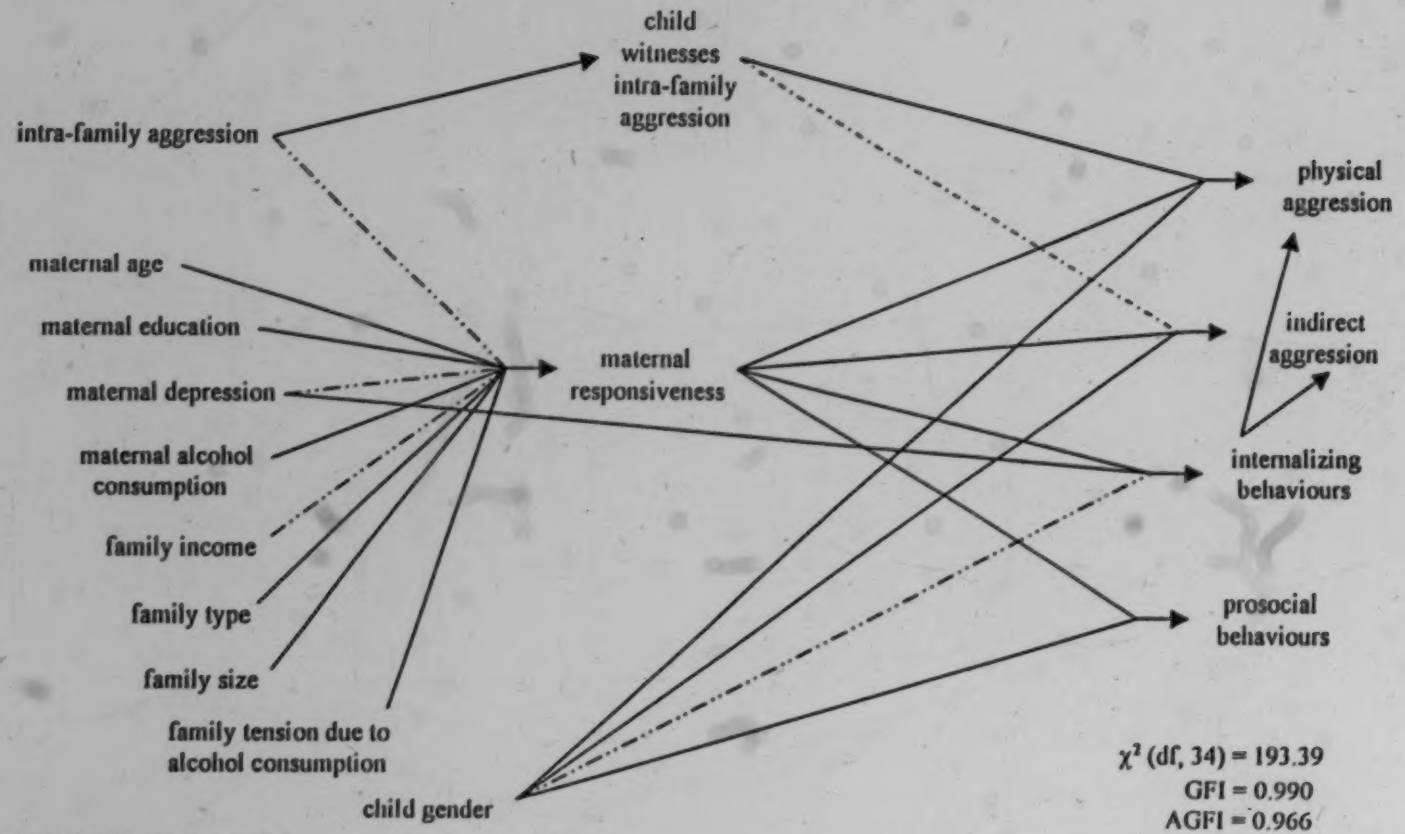
Maternal responsiveness was positively influenced by maternal education ($\gamma_{2,2}$ = 0.154, $p < 0.01$) and negatively influenced by maternal age ($\gamma_{2,1}$ = -0.183, $p < 0.01$), maternal alcohol consumption ($\gamma_{2,4}$ = -0.135, $p < 0.001$), family type ($\gamma_{2,6}$ = -0.778, $p < 0.001$), family size ($\gamma_{2,7}$ = -0.624, $p < 0.001$), and family tension due to alcohol consumption ($\gamma_{2,8}$ = -0.416, $p < 0.001$). With the exception of maternal age, all of the effects were in the expected direction. Contrary to both samples of younger children, aggression in the family did not significantly decrease maternal responsiveness, and maternal depression did not significantly influence maternal responsiveness.

Witnessing physical aggression in the family significantly contributed to children's use of physical aggression. For every unit increase in children's witnessing aggression (e.g., from "never" witnessing aggression to "seldom" witnessing), their use of physical aggression increased 0.567 units ($p < 0.001$). Contrary to the other samples, witnessing aggression did not have a significant effect on children's use of indirect aggression.

Maternal responsiveness directly influenced children's use of physical aggression ($\beta_{3,2}$ = -0.052, $p < 0.001$), indirect aggression ($\beta_{4,2}$ = -0.046, $p < 0.01$), and children's internalizing behaviours ($\beta_{5,2}$ = -0.167, $p < 0.001$). Maternal responsiveness also had a direct effect on children's prosocial behaviours. For every unit increase in maternal responsiveness, children's use of prosocial behaviours increased by 0.494 units ($p < .001$).

While maternal depression did not have a direct effect on maternal responsiveness, it did have a direct effect on children's internalizing behaviours ($\gamma_{5,3}$ = 0.170, $p < 0.001$).

Figure 5: Modified Model III: Older School-Age Children



Note: significant pathways shown by solid lines

Table 10

Maximum Likelihood Estimates for the Effects in Modified Model III: Older School-Age Children[a]

Effect *To*	From	Unstandardized Effect	Standardized Effect	Explained Variance
Child witnesses intra-family aggression				69.9%
	Intra-family aggression	1.000[b]	0.836[b]	
Maternal responsiveness				9.2%
	Intra-family aggression	-0.244	-0.036	
	Maternal age	-0.183**	-0.064**	
	Maternal education	0.154**	0.071**	
	Maternal depression	-0.018	-0.042	
	Maternal alcohol consumption	-0.135***	-0.100***	
	Family income	0.008	0.003	
	Family type	-0.778***	-0.119***	
	Family size	-0.624***	-0.217***	
	Family tension due to alcohol	-0.416***	-0.111***	
Physical Aggression				33.6%
	Child witnesses intra-family aggression	0.567***	0.160***	
	Maternal responsiveness	-0.052***	-0.083***	
	Internalizing behaviours	0.302***	0.507***	
	Child gender	0.465***	0.155***	
Indirect aggression				26.9%
	Child witnesses intra-family aggression	-0.042	-0.011	
	Maternal responsiveness	-0.046**	-0.070**	
	Internalizing behaviours	0.309***	0.495***	
	Child gender	-0.179**	-0.057**	
Internalizing behaviours				17.4%
	Maternal responsiveness	-0.167***	-0.158***	
	Maternal depression	0.170***	0.366***	
	Child gender	-0.173	-0.034	

(Table 10 continued....)

Effect To From	Unstandardized Effect	Standardized Effect	Explained Variance
Prosocial behaviours			17.7%
Maternal responsiveness	0.494***	0.370***	
Child gender	-1.270***	-0.200***	
Chi square			193.39
Degrees of freedom			34
Probability			.000
GFI			.990
AGFI			.966

[a] $n = 2654$. [b] coefficient fixed.
*$p < 0.05$. **$p < 0.01$. ***$p < 0.001$.

Children who lived with mothers who experienced more symptoms of depression were more sad, withdrawn, and depressed themselves. The total effect of depression on children's internalizing behaviours mediated though maternal responsiveness was 0.173, $p < 0.001$. A summary of direct, indirect, and total effects of maternal depression on children's internalizing behaviours is outlined in Table 11.

Children who expressed more internalizing behaviours also behaved more aggressively. Because both maternal depression and responsiveness contributed to children's internalizing behaviours, they ultimately influenced children's aggression even though the pathways were not direct. The total effect of maternal responsiveness (i.e., direct and indirect effect) on children's use of physical aggression was -0.102 ($p < 0.001$) and on children's use of indirect aggression was -0.098 ($p < 0.001$). Although both effects were weak, they were statistically significant.

Children who were more sad, withdrawn, and depressed behaved more aggressively using both forms of aggression. For every unit increase in children's internalizing behaviours, their use of physical aggression increased by 0.302 units and indirect aggression increased by

Table 11

Direct, Indirect, and Total Effects In Model III: Older School-Age Children

Effect		Effect		
From	*To*	Direct	Indirect	Total
Maternal responsiveness	*Physical aggression*	-0.052***	-0.050***	-0.102***
Maternal responsiveness	*Indirect aggression*	-0.046**	-0.052***	-0.098***
Maternal depression	*Internalizing behaviours*	0.170***	0.003	0.173***

*$p < 0.05$. **$p < 0.01$. ***$p < 0.001$.

0.309 units. Both effects were statistically significant ($p < 0.001$).

As predicted, gender influenced some responses in children. Boys used significantly more physical aggression ($\gamma_{3,9} = 0.465$, $p < 0.001$) and less indirect aggression ($\gamma_{4,9} = -0.179$, $p < 0.01$) than girls. Boys were less socially competent ($\gamma_{6,9} = -1.270$, $p < 0.001$) than girls. There were no statistically significant gender effects for internalizing behaviours in this sample.

In summary, similar to both younger samples, older school-age children were negatively affected by witnessing physical aggression in their families and by the disruption to parenting that occurred in families characterized by this type of behaviour. Given the large sample size, the model fit the data reasonably well. The theoretical perspectives together explained a modest portion of the variance in older school-age children's adjustment.

CHAPTER 8

MODEL IV: MATERNAL AND CHILD REPORTS

All previous models (i.e., Model I, II, and III) were based on maternal reports. In this model, child reports were used in addition to maternal reports of parenting behaviour and children's adjustment. Children aged 10 to 11 years old self-completed questionnaires that replicated the information collected from the parent. They were instructed to complete the questionnaires in a separate room and return them to the interviewer in a sealed envelope.

Characteristics of the Older School-Age Sample

There were 2,921 children aged 10 and 11 years old who met the criteria for inclusion in the analyses. After the listwise deletion of missing cases, the final sample size was 2,174 children. This sample is representative of 494,692 Canadian children. There were slightly more 10 year olds (51.4%) and more girls (51.6%) in the sample of children who self-completed questionnaires. Similar to all other samples, the majority of these children lived in two-parent families (84.8%) and in families with incomes classified as middle or upper middle income (68.0%).

According to parental reports, 89.8% of these children had "never" witnessed physical aggression in their families. A small number (7.4%) of children had witnessed physical aggression on a "seldom" basis, 2.0% of children had witnessed it 'sometimes", and 0.7% of children had witnessed it "often".[15] Children were not asked to provide their own information about witnessing aggression.

The Measurement Model

A diagrammatical representation of Model V is depicted in Figure 6. The matrix equations for this model are presented in Appendix C. The measurement structure of Model IV is different than all previous models since the model employs two indicators to measure the parenting and child adjustment concepts. This results in a model with double indicators for five concepts. The first indicator was measured using the mother's report and the second

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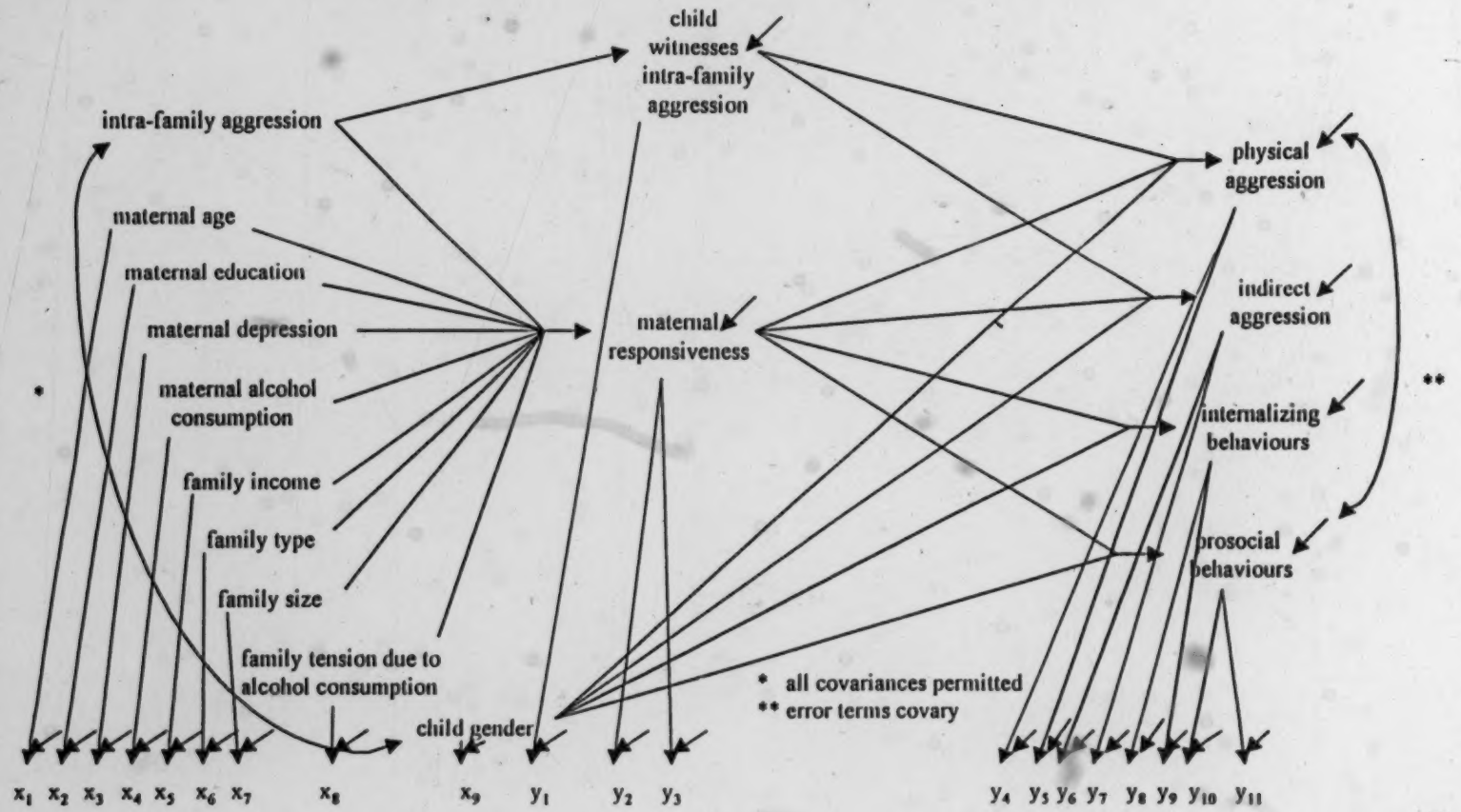
[15] Numbers add to 99.9% due to rounding.

Figure 6: Measurement Model IV: Older School-Age Children Using Maternal and Child Reports



indicator was measured using the child's report of the same variable. The following section clarifies which concepts were measured with single or double indicators.

The Indicators for the Exogenous Concepts

The indicators for the exogenous concepts in Model IV replicate the specification of Model I to III and follow the same numbering format (i.e., x_1 to x_9). Each exogenous concept was measured using a single indicator. The same measure was used as in the previous models. That is, maternal depression was measured using the total score of the Depression Scale and the other exogenous concepts were measured using individual survey items. Thus, all information for these exogenous concepts was provided by parental report.

The Indicators for the Endogenous Concepts

Child witnesses intra-family aggression (η_1), the first endogenous concept, was measured using a single indicator (y_1). This information was only provided by the parent. All other endogenous concepts are measured using two indicators for this analysis.

Maternal responsiveness (η_2) was measured using two indicators. The first indicator *mother's report* (y_2) was measured using the total score of the Positive Interaction Subscale of the Parenting Scale [APRCS03]. The second indicator *child's report* (y_3) was measured using the total score of the Parental Nurturance Subscale of the My Parents and Me Scale [AE1CS01].

Physical aggression (η_3) was measured using two indicators. The summative score of the Physical Aggression-Conduct Disorder Subscale of the Behaviour Scale [ABECS09] was used for the *mother's report* (y_4). The summative score of the Physical Aggression-Conduct Disorder Subscale of the Feelings and Behaviours Scale [AD1CS03] was used for the *child's report* (y_5).

Indirect aggression (η_4) was measured with two indicators. The *mother's report* (y_6) was measured using the summative score of the Indirect Aggression Subscale of the Behaviour Scale [ABECS10]. The *child's report* (y_7) was measured using the summative score of the Indirect Aggression Subscale of the Feelings and Behaviours Scale [AD1CS01].

Internalizing behaviours (η_5) was measured using two indicators. The *mother's report* (y_8) was measured using the total score of the Emotional Disorder-Anxiety Subscale of the Behaviour Scale [ABECS08]. The *child's report* (y_9) was measured using the total score of the Emotional Disorder-Anxiety Subscale of the Feelings and Behaviours Scale [AD1CS02].

Prosocial behaviours (η_6) was measured by two indicators. The summative score of the Prosocial Behaviour Subscale of the Behaviour Scale [ABECS07] was used for the *mother's report* (y_{10}). The summative score of the Prosocial Subscale of the Feelings and Behaviours Scale [AD1CS05] was used for the *child's report* (y_{11}).

Fixed Coefficients, Scaling, and Reliability

Only one coefficient was constrained in the model. The pathway from intra-family aggression to child witnesses intra-family aggression ($\gamma_{1,10}$) was fixed at 1.0. An initial starting value for the element in the phi matrix corresponding to the variance of intra-family aggression (i.e., $\Phi_{10,10}$) was provided so that this variance would account for approximately 70% of the variance in child witnesses intra-family aggression. These strategies, done to facilitate estimation of a model with a phantom variable, were discussed in greater detail in the Fixed Coefficients, Scaling, and Reliability Section in Chapter 5.

All concepts measured using single indicators, with the exception of the phantom concept, were scaled by specifying a value of one (i.e., fixing lambda [λ] at 1.0) to link the concept to its respective indicator. A unit change in the concept, therefore, was scaled to be the same as a unit change in the indicator (Hayduk, 1987). For all endogenous concepts measured using double indicators, the first indicator was fixed (i.e., lambda [λ_y] fixed at 1.0 for the parent's indicator) and the second was left free to be estimated. Using this approach, the meaning of each concept was constrained to derive its meaning from the first indicator. The second indicator, the child's report, was then compared to the first indicator. The rationale for choosing the mother's indicator was that the majority of past research had usually obtained parental reports.[16]

16

This asserts that the parent's indicator is more closely aligned with the meaning of the concept. The original intention was to avoid this assertion since the objective of the study was to determine if there were differences depending on whether maternal or child reports were used. Consequently, the model was initially specified with neither indicator scaled and the error variance of both indicators left free to be estimated by the model. The estimation, however, resulted in a covariance matrix of the errors in the conceptual model (i.e., PSI matrix) that was not positive definite indicating an under-identified model. The estimates were, therefore, not trustworthy.

A specific portion of measurement unreliability was assigned to each single indicator and to the first of the double indicators (i.e., theta epsilon was fixed for the parent's indicator) (Hayduk, 1987). The second indicator was left free to be estimated. This strategy allowed the LISREL program to estimate the error variance and provide an indication as to whether both indicators were good measures of their respective underlying concepts.

The proportion of error variance assigned to each indicator was determined using the same method as in previous models. For concepts measured using the total score of a scale, the results of the reliability analyses were used to estimate the unreliability of each measure (i.e., error = 1 - α) (Hayduk, 1987) with an additional 0.5% added to allow for the occasional data entry error. Using this method, the actual percent of variance assigned to error in the parent indicators was as follows: 28.5% for maternal responsiveness, 25.5% for physical aggression, 21.5% for indirect aggression, 18.5% for internalizing behaviours, and 20.5% for prosocial behaviours. The actual percent of variance assigned to error in all other indicators was the same as in the other models. The indicator for child gender and family type were assigned 0.5% error, maternal age and education were assigned 1.0% error, family income was assigned 2.0% error, family size was assigned 3.0% error, maternal alcohol consumption and family tension were assigned 5.0% error and child witnesses was assigned 10.0% error. These percentages were the same as those for Model I, II, and III (Table 2). Only the actual variance that was fixed differs because this depends on the variance of each indicator.

Univariate Description of the Indicators in Model IV

The univariate description of the indicators in Model IV is illustrated in Table 12. Consistent with the data used in the other models, the multivariate distribution is non-normal judging by the non-normality of the univariate distribution. In particular, the indicators *maternal depression* (x_3), *family tension* (x_8), *child witnesses* (y_1), *mother's and child's report of physical aggression* (y_4 and y_5 respectively), *mother's and child's report of indirect aggression* (y_6 and y_7 respectively) and the *mother's report of internalizing behaviours* (y_8) were not normally distributed. As expected, the most problematic indicator was *child witnesses* (y_1), a variable that was not expected to have a normal distribution.

In comparison to maternal ratings, children rated their mother's responsiveness slightly higher. They also rated their use of physical aggression, indirect aggression, internalizing behaviours, and prosocial behaviours higher than the mothers. The differences, though, were not remarkable.

Table 12

Univariate Description of the Indicators in Model IV: Older School-Age Children using Maternal and Child Reports[a]

Indicator	Range	Mean (SD)	Skewness	Kurtosis
Maternal age (x_1)	1 - 5	4.03 (0.84)	-0.42	-0.65
Maternal education (x_2)	1 - 4	2.82 (1.09)	-0.48	-1.10
Maternal depression (x_3)	0 - 35	4.73 (5.89)	2.17	5.49
Maternal drinking (x_4)	0 - 7	2.01 (1.80)	0.73	-0.37
Family income (x_5)	1 - 5	3.56 (0.97)	-0.22	-0.58
Family type (x_6)	0 - 1	0.15 (0.36)	N/A	N/A
Family size (x_7)	1 - 4	2.41 (0.85)	0.34	-0.48
Family tension (x_8)	1 - 4	1.42 (0.66)	1.57	2.33
Child gender (x_9)	0 - 1	0.48 (0.50)	N/A	N/A
Child witnesses (y_1)	1 - 4	1.14 (0.45)	3.85	16.21
Maternal responsiveness (y_2) - mother's report	1 - 20	11.58 (2.77)	0.01	-0.11
Maternal responsiveness (y_3) - child's report	1 - 15	12.02 (2.85)	-0.92	0.15
Physical aggression (y_4) - mother's report	0 - 12	1.17 (1.71)	2.21	5.98
Physical aggression (y_5) - child's report	0 - 12	1.26 (1.78)	2.06	5.48
Indirect aggression (y_6) - mother's report	0 - 10	1.41 (1.79)	1.60	2.96
Indirect aggression (y_7) - child's report	0 - 10	1.90 (1.98)	1.20	1.32
Internalizing behaviours (y_8) - mother's report	0 - 15	2.87 (2.77)	1.16	1.12
Internalizing behaviours (y_9) - child's report	0 - 16	3.72 (2.85)	0.73	0.23
Prosocial behaviours (y_{10}) - mother's report	0 - 20	13.44 (3.53)	-0.24	-0.35
Prosocial behaviours (y_{11}) - child's reports	0 - 20	14.60 (3.52)	-0.51	-0.05

[a] $n = 2174$

Identification

User-specified starting values provided the computer program with an initial set of reasonable estimates to facilitate the estimation process. The program required 42 iterations to converge to an acceptable solution which was not very problematic given that the model employed multiple indicators. Similar to the other estimations, the matrix of structural coefficients for the exogenous variables (i.e., [lambda [Λ_x]) had a rank less than its order. There was no other warnings in the output suggestive of major problems. The zero partial derivatives for the free coefficients implied the maximum of the likelihood function had been reached. Therefore, estimates were truly maximum likelihood (Hayduk, 1987).

Model Estimation

Estimation of the initial double indicator model resulted in a chi-square (χ^2) of 2417.50, with 115 degrees of freedom and a probability less than 0.001. The GFI and the AGFI were 0.894 and 0.806, respectively. All indices suggested that the model did not fit the data. Rather than making numerous changes to improve the model's fit, an examination was undertaken to determine the source and nature of the ill-fit.

Almost 38% of the residuals exceeded an absolute value of 1.96, an indication that there were many discrepancies between the population and the sample covariance matrix. In particular, there were numerous discrepancies between the covariances between the parent and child indicators of the same concept. Problems were not confined to one area but rather to all concepts that used both parent and child reports. For every pair of observed variables for all of the endogenous concepts that employed two indicators, with the exception of internalizing behaviours, the residuals were negative indicating that the model overestimated the covariance between the two variables. Further, there was little congruence between the portion of explained variance for the parent and child indicators indicating substantial problems with the measurement structure of the model. A summary of the error variance for both indicators is presented in Table 13. For all endogenous concepts that employed double indicators, the majority of the variance in the second (i.e., child) indicator was attributed to error. The error variance in the child's indicator was three to four times larger than the parent's indicator suggesting systematic differences in the parent and child responses for the same concept. The estimated error variance for the second indicator (i.e., child) ranged from 85.5% to 93.8% indicating that the majority of the variance in the indicators were being derived from sources other than the corresponding concept. The source of ill fit in the model

Table 13

Comparison of Error Variance in Indicators in Model IV: Older School-Age Children Using Maternal and Child Reports

Concept	Percentage of Error Variance	
	Parent Indicator [1]	Child Indicator [2]
Maternal responsiveness	28.8	93.8
Physical aggression	25.8	85.5
Indirect aggression	21.5	90.2
Internalizing behaviours	18.5	87.7
Prosocial behaviours	20.5	90.0

[1] Error variances were fixed.[17]

[2] Error variances were estimated.

were in large part emanating from the measurement structure of the model. The failure of the model calls into question the assumption that both parent and child can provide a good measure of the same underlying concept. Correlations between the corresponding parent and child reports were all weak. Mothers' and children's rating of maternal responsiveness correlated at 0.17. Correlations on measures of children's adjustment were as follows: physical aggression ($r = 0.31$), indirect aggression ($r = 0.27$), internalizing behaviours ($r = 0.31$), and prosocial behaviours ($r = 0.27$). Despite the fact that the correlations were all significant at 0.001, they were low correlations considering that the instruments were designed to measure the same concept.

In specifying the model using two indicators to measure the same respective concept, it assumes that both indicators provide a good measure of the underlying concept. In the present analyses, this did not occur. The two indicators were not measuring the same underlying concept. The indicators were measuring something different. The differences were systematic -- they occurred in virtually all variables that were measured by both parent and child. It appeared that the parent and child were not reporting on the same underlying concept.

[17] There is a slight difference from the percent of variance (less than 0.5%) specified as error since the LISREL program can alter these in order to find the best fit of the model.

CHAPTER 9

MODEL V: MULTIPLE INDICATOR MODEL

To date, there is no consensus among structural equation methodologists on how to best specify the measurement structure that links concepts to their indicators. A common practice in causal modeling is to use the summative score of a scale as the single indicator of a concept. Scales are developed based on the assumption that a single item is often insufficient to measure the factor or concept with precision (Statistics Canada, 1997; Waltz, Strickland, & Lenz, 1991). For similar reasons, researchers employ the total score of a scale as an indicator in causal modeling efforts. However, there have been problems identified with this approach because scales often measure more than one underlying concept (Hayduk, 1987; Ratner, Bottorff, Johnson, & Hayduk, 1996). Scales that are multidimensional are problematic in causal modeling. If the scale is constructed of items that are not measuring the same underlying concept (i.e., are in fact multidimensional), the diagnostics will provide warning signs that the model is misspecified (Hayduk, 1987). Scales that are truly multidimensional but assumed to be unidimensional can limit the diagnostic capabilities of structural equation modeling (Hayduk; 1987; Ratner et al., 1996).

In Model I through III, the hypothesized model was estimated using single indicators to measure all concepts. Certain concepts such as maternal depression, maternal responsiveness, as well as all the child adjustment measures used the summative scores of scales as indicators. Statistics Canada followed the traditional approach advocated by psychometricians to scale construction. That is, they choose items that appeared to measure the same underlying concept and tested this assumption using factor analysis. Only those items that loaded on the same factor were retained. However, factor analysis evaluates measures in isolation from one another, it examines measures of each construct separately. For this reason, this method of validation has limitations. Structural equation modeling, however, provides an alternative to factor analysis because it provides a more rigorous test for unidimensionality than factor analysis. Thus, the purpose of this modeling exercise was to test the dimensionality of the scale data within the context of LISREL.

Characteristics of the Preschool Sample

The data from the preschool sample were used in this analysis. It should be noted that this estimation procedure relied on information provided by the mother. The sample was based on the complete responses of 3,014 children. The characteristics of the sample were previously described in Chapter 5.

The Measurement Model

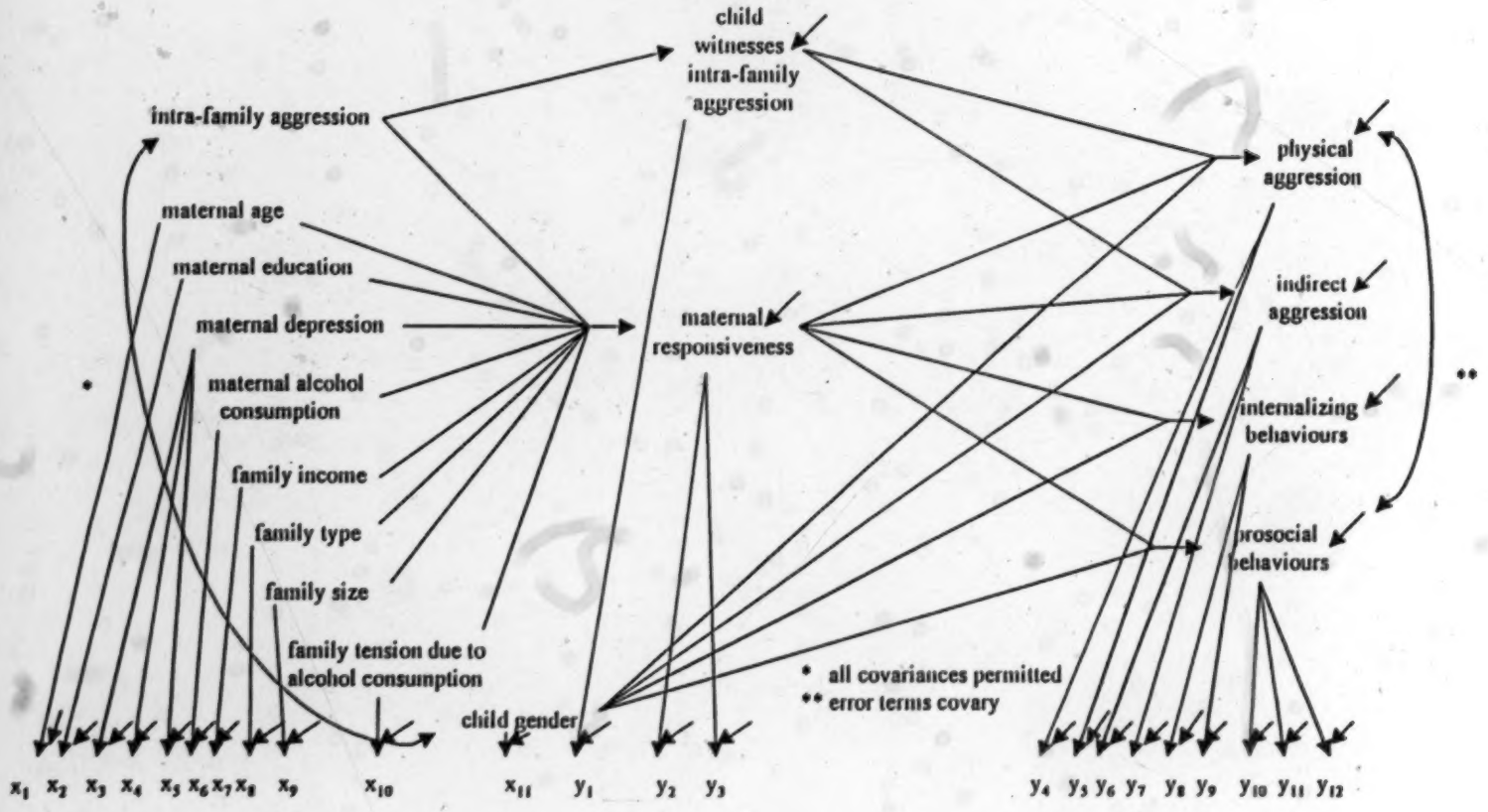
The full model including the measurement structure for Model V is specified in Figure 7 and is mathematically represented in Appendix C. The measurement structure of Model V is different than all previous models. In this analysis, a combination of both single indicators and multiple indicators were used. Multiple indicators were used for all concepts that were previously measured using the total score of a scale. The remaining concepts used single indicators. Criteria for choosing the multiple indicators for each concept was that all items were theoretically reasonable and all were believed to be similar to each other in meaning and wording. The factor loadings conducted by Statistics Canada were not available to inform the choice of items. The number of indicators chosen for each concept depended on the number of items in the scale. Three items were chosen as indicators for the concepts of maternal depression and prosocial behaviours since the scales were composed of 12 items and 10 items, respectively. Two indicators were chosen for the concepts of maternal responsiveness, physical aggression, indirect aggression and internalizing behaviours since the number of items in these scales ranged from five to eight items.

The Indicators for the Exogenous Concepts

The indicators for all exogenous concepts measured using individual survey items remain the same for this estimation procedure. The only exogenous concept that was measured using the total score of a scale was maternal depression.

Maternal depression (ξ_3) was measured by three indicators for this estimation procedure. The indicator *felt depressed* (x_3) was measured by the parent's response to: "I felt depressed" [ADPPQ12D]. The second indicator *felt blue* (x_4) was measured by responses to: "I felt that I could not shake off the blues even with help from my family or friends" [ADPPQ12B]. The third indicator *was unhappy* (x_5) was measured by reverse scoring the responses to: "I was happy" [ADPPQ12H]. Responses were coded: 1 = rarely or none of the

Figure 7: Measurement Model V: Preschool Children Using Multiple Indicators



time (less than 1 day), 2 = some or a little of the time (1 - 2 days), 3 = occasionally or a moderate amount of time (3 - 4 days), 4 = most or all of the time (5 - 7 days).

The Indicators for the Endogenous Concepts

All the endogenous concepts, with the exception of child witnesses intra-family aggression, were measured using the summative scores of scales in all previous estimations. Therefore, these concepts were measured in this estimation using multiple indicators as follows.

Maternal responsiveness (η_2) was measured by two indicators. The indicator *talks/plays with child* (y_2) was measured by responses to: "How often do you and he/she talk or play with each other, focusing attention on each other for five minutes or more, just for fun?" [APRCQ2]. The second indicator *special activity with child* (y_3) was measured by responses to: "How often do you do something special with him/her that he/she enjoys?" [APRCQ06]. Responses were coded on a five point response scale as follows: 1 = never, 2 = about once a week of less, 3 = a few times a week, 4 = one or two times a day, 5 = many times each day.

Physical aggression (η_3) was measured using two indicators. The first indicator *attacks other children* (y_4) was assessed by responses to: "Physically attacks people?" [ABECQ6AA]. The second indicator *gets into fights* (y_5) was measured by responses to: "Gets into many fights?" [ABECQ6G]. Responses were coded on a three point response category: 1 = never or not true, 2 = sometimes or somewhat true, and 3 = often or very true.

Indirect aggression (η_4) was measured by two indicators. The indicator *tells others to avoid child* (y_6) was measured by: "When mad at someone, says to others: let's not be with him/her?" [ABECQ6LL]. The second indicator *gets others to dislike child* (y_7) was measured by: "When mad at someone, tries to get others to dislike that person?" [ABECQ6J]. Responses were coded as above.

Internalizing behaviours (η_5) was measured using two indicators. The indicator *unhappy, tearful, or distressed* (y_8) was measured by responses to: "Appears miserable, unhappy, tearful, or distressed?" [ABECQ6II]. The second indicator *unhappy, sad, or depressed* (y_9) was measured by responses to: "Seems to be unhappy, sad, or depressed?" [ABECQ6F]. Responses were coded as above.

Prosocial behaviours (η_6) was measured using three indicators. The first indicator *helps sick child* (y_{10}) was measured using: "Helps other children (friends, brother or sister) who are feeling sick?" [ABECQ6SS]. The second indicator *helps hurt child* (y_{11}) was measured by: "Will try to help someone who has been hurt?" [ABECQ6D]. The final indicator *comforts crying child* (y_{12}) was measured by: "Comforts a child (friend, brother or sister) who is crying or upset?" [ABECQ6BB]. Responses were coded as above.

Fixed Coefficients, Scaling, and Reliability

Two strategies were taken to facilitate estimation of a model with a phantom variable. The pathway from intra-family aggression to child witnesses intra-family aggression ($\gamma_{1,10}$) was fixed at 1.0 and the variance in the phi matrix corresponding to intra-family aggression (i.e., $\Phi_{10,10}$) was manipulated to account for approximately 70% of the variance in child witnesses intra-family aggression. Both procedures had been used in all previous models.

Each concept that employed a single indicator (other than the phantom concept) was scaled by specifying a value of one (i.e., fixing lambda [λ] at 1.0) to link the concept to its indicator. For concepts that employed multiple indicators, the first indicator was fixed. The loadings on the second and third indicator when used were left free to be estimated. This specification forces the latent concepts to be scaled in the same manner as the first or only indicator (Hayduk, 1987).

In addition, each concept was adjusted for measurement unreliability. A specific proportion of measurement unreliability was assigned to each concept measured with a single indicator (Hayduk, 1987). The proportion of error variance assigned to the indicators for maternal age, maternal education, maternal alcohol consumption, family income, family type, family size, family tension, child gender, and child witnesses intra-family aggression was the same proportion that was assigned in Model I. This was done to make it comparable to the model that used only single indicators to measure all concepts.

A fixed error variance was not assigned to any of the multiple indicators. They were all left free to be estimated by the model. This strategy allowed the LISREL program to estimate the error variance. The alternate and usual approach is to assign an error variance to the first indicator leaving the other indicators free to be estimated. With this strategy, the meaning of the concepts are constrained; they derive their meaning from the first indicator. Other indicators are then compared to the first indicator. This strategy, although the

customary approach to LISREL, defeats the purpose of this modeling exercise which was to assess whether all indicators were good measures of the underlying concepts.

Univariate Description of the Indicators in Model V

The univariate description of the indicators in Model V is presented in Table 14. Consistent with the data used in the other models, the multivariate distribution was non-normal judging by the non-normality of the univariate distribution. As expected, *child witnesses* (y_1) was problematic. In addition, all three indicators for *maternal depression* (x_3, x_4 and x_5), *family tension* (x_{10}), the first indicator for *physical aggression* (y_4), the second indicator for *indirect aggression* (y_7), and the first indicator for *internalizing behaviours* (y_8) were not normally distributed.

Identification

User-specified starting values were provided. The same process of determining start values was used as in all previous models. Other than the warning that the matrix of structural coefficients for the exogenous variables (i.e., [lambda [Λ_x]) did not have full column rank, which was expected because of the phantom concept, there were no warning signals in the output to suggest problems with identification. The program did have more problems converging; it took 53 iterations to converge to an acceptable solution. This is not too demanding given that the model employs multiple indicators. Partial derivatives for the free coefficients were zero implying that the maximum of the likelihood function had been reached and estimates were truly maximum likelihood (Hayduk, 1987). Estimates were, therefore, assumed to be reasonable.

Model Estimation

The model, constructed using multiple indicators, resulted in a chi-square (χ^2) of 831.89 (df = 169), $p = 0.000$. The GFI and the AGFI were 0.976 and 0.961, respectably, suggesting a reasonable fit of the model. The fit was surprising given that models with multiple indicators are prone to failing because of the stringency of their proportionality demands. Moreover, the use of several concepts with multiple indicators makes the proportionality constraints even more stringent (Hayduk, 1996). Parallel modifications to the first model were desired to allow comparison between the current model and the model estimated using the total scores of scales as single indicators (i.e., compare Model V and I).

Table 14

Univariate Description of the Indicators in Model V: Preschool Children Using Multiple Indicators[a]

Indicator	Range	Mean (SD)	Skewness	Kurtosis
Maternal age (x_1)	1 - 5	3.19 (1.01)	-0.06	-0.46
Maternal education (x_2)	1 - 4	2.90 (1.07)	-0.52	-1.02
Maternal depression (x_3) - felt depressed	1 - 4	1.37 (0.70)	1.92	3.06
Maternal depression (x_4) - felt blue	1 - 4	1.28 (0.66)	2.54	5.95
Maternal depression (x_5) - was unhappy	1 - 4	1.30 (0.68)	2.40	5.21
Maternal drinking (x_6)	0 - 7	1.96 (1.66)	0.63	-0.57
Family income (x_7)	1 - 5	3.41 (1.00)	-0.25	-0.48
Family type (x_8)	0 - 1	0.15 (0.36)	N/A	N/A
Family size (x_9)	1 - 4	2.28 (0.82)	0.44	-0.21
Family tension (x_{10})	1 - 4	1.47 (0.67)	1.52	2.44
Child gender (x_{11})	0 - 1	0.51 (0.50)	N/A	N/A
Child witnesses (y_1)	1 - 4	1.09 (0.36)	4.26	19.02
Maternal responsiveness (y_2) - talks/plays with child	1 - 5	4.24 (0.76)	-0.74	0.21
Maternal responsiveness (y_3) - special activity with child	1 - 5	3.19 (0.86)	0.38	-0.37
Physical aggression (y_4) - attacks other children	1 - 3	1.22 (0.44)	1.97	3.04
Physical aggression (y_5) - gets into fights	1 - 3	1.40 (0.57)	1.07	0.14
Indirect aggression (y_6) - tells others to avoid child	1 - 3	1.23 (0.44)	1.53	1.00
Indirect aggression (y_7) - gets others to dislike child	1 - 3	1.13 (0.36)	2.83	7.65
Internalizing behaviours (y_8) - unhappy, tearful, distressed	1 - 3	1.21 (0.43)	1.78	2.05
Internalizing behaviours (y_9) - unhappy, sad, or depressed	1 - 3	1.23 (0.44)	1.51	0.92
Prosocial behaviours (y_{10}) - helps sick child	1 - 3	2.21 (0.63)	-0.20	-0.63

(Table 14 continued....)

Indicator	Range	Mean (SD)	Skewness	Kurtosis
Prosocial behaviours (y_{11}) - helps hurt child	1 - 3	2.46 (0.61)	-0.66	-0.52
Prosocial behaviours (y_{12}) - comforts crying child	1 - 3	2.39 (0.60)	-0.41	-0.68

*$n = 3014$

Model Modifications

The coefficient from maternal depression to children's internalizing behaviours ($\gamma_{5,3}$) was freed. This change resulted in a modest improvement to the model. The chi-square (χ^2) was now 792.43 with 168 degrees of freedom ($p < 0.001$). The GFI was 0.977 and the AGFI was 0.963. There was still sufficient reason to pursue making the subsequent modifications. Consequently, the coefficients from children's internalizing behaviours to physical aggression ($\beta_{3,5}$) and indirect aggression ($\beta_{4,5}$) were freed. The corresponding correlated error terms ($\psi_{3,5}$ and $\psi_{4,5}$) were removed as in the other models to eliminate the collinearity problem. The modified model resulted in a chi square (χ^2) of 744.78 with 168 degrees of freedom ($p < 0.001$). The GFI was 0.979 and the AGFI was 0.965.

Maximum Likelihood Estimates for Modified Model V

The modified model is outlined in Figure 8. Coefficients that were statistically significant appear as solid lines while insignificant ones appear as broken lines. The model did not fit as well as Model I which was estimated using single indicators. Examination of the coefficient estimates revealed substantial problems with the measurement structure. Results showed that the multiple indicators were relatively similar to each other for several of the concepts but were not particularly good measures of the underlying concepts. With some exception, the estimated percent of error variance exceeded the explained variance (Table 15). This indicates that one-half to almost three-quarters of the variances were being derived from sources other than the corresponding concepts.

Figure 8: Modified Model V: Preschool Children Using Multiple Indicators

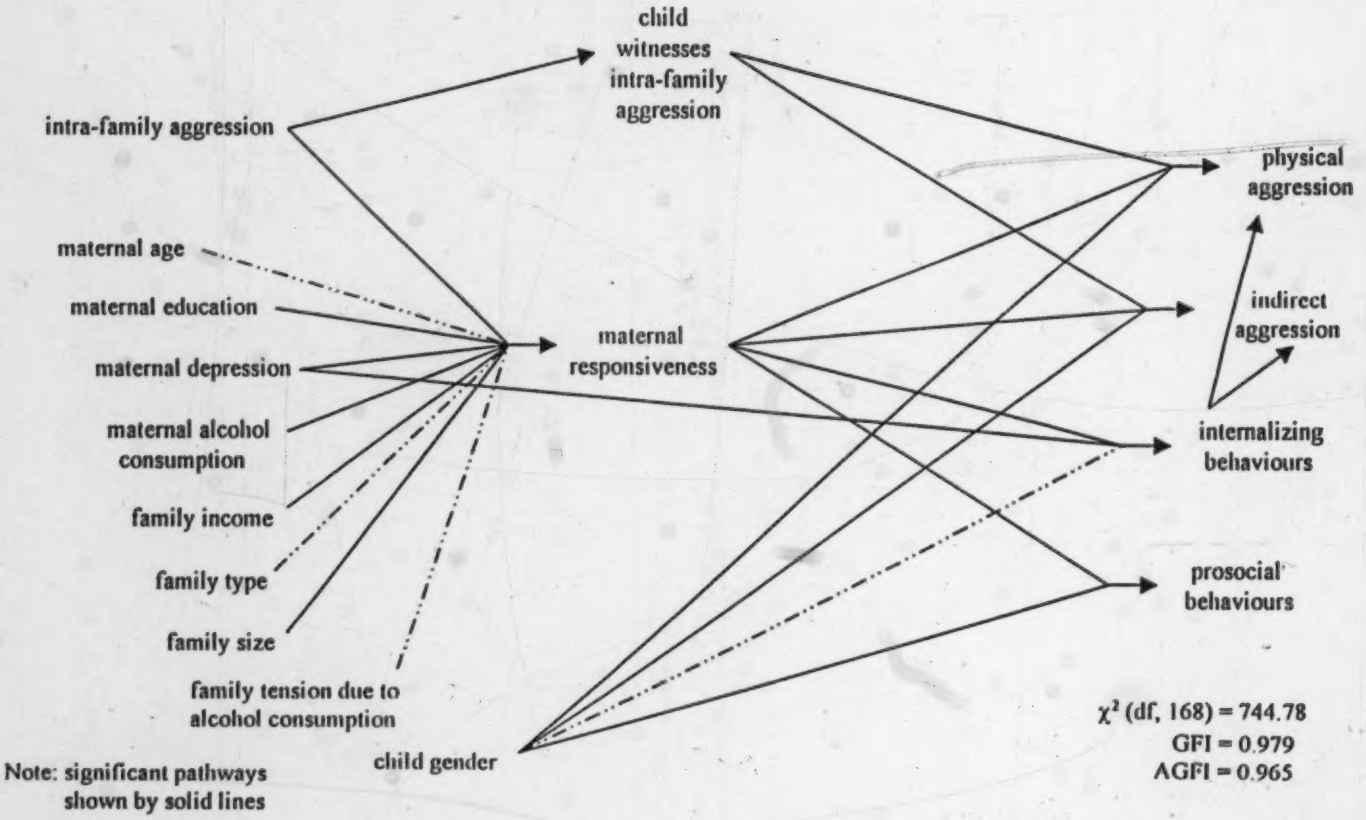


Table 15

Percentage of Estimated Error Variance in Indicators in Model V: Preschool Children Using Multiple Indicators

Concept	Estimated Percentage of Error Variance		
	Indicator I	Indicator II	Indicator III
Maternal depression	34.7	35.2	67.4
Maternal responsiveness	48.6	72.2	N/A[1]
Physical aggression	59.8	57.4	N/A
Indirect aggression	54.4	61.1	N/A
Internalizing behaviours	61.9	58.0	N/A
Prosocial behaviours	46.7	58.3	48.2

[1] These concepts were measured using two indicators.

The indicators for the child adjustment outcomes were generally less problematic than the indicators for the parent measures. For instance, the indicators for physical aggression were both equally good although they were not very good measures of the underlying concept of physical aggression. Approximately 60% of the variance in the indicator was being derived from sources other than the corresponding concept of physical aggression. Nevertheless, both indicators were about equally good. The indicators for indirect aggression were also approximately equal, although they too were not particularly good measures of the underlying concept of indirect aggression.

The indictors for the maternal variables were far more problematic than the child outcomes. For instance, the error variance for the second indicator for maternal responsiveness was much larger than the first indicator. This indicated that the meaning of the first indicator is closer to the meaning of the concept than the second indicator. Likewise, the error variance for the third indicator for maternal depression was much larger than the first and second indicator. This indicates that the meaning of the first and second indicator is closer to the meaning of the concept than the third indicator. While this estimation procedure did not assess all the items in each scale (i.e, only two or three items were used), there does appear to be some problems with the scales. Although designed to measure one dimension, all indicators were not equally good at reflecting that dimension. Nevertheless, the scales, while less than perfect, were not totally unsatisfactory measures of the concepts.

Due to the measurement problems, the model did not fit as well as Model I. The maximum likelihood estimates for the modified model are presented in Table 16. The maximum likelihood estimates for Model I and Model IV using a standardized solution are presented in Table 17 to allow for comparison. Overall, the results of the multiple indicator model (i.e., Model V) support the findings of the single indicator model (i.e., Model I). With the exception of the structural coefficient for maternal age to maternal responsiveness, all structural coefficients were in the same direction. The reason that this structural coefficient is in the opposite direction may possibly be explained by random sampling fluctuations around zero since neither effects in Model I or IV were statistically significant. The only other inconsistency in the two models was the influence of maternal responsiveness on children's use of physical aggression. This effect was significant in the multiple indicator model and insignificant in the single indicator model. It is interesting to note that the insignificant pathway was also inconsistent with both Model II and III. In both samples of older children, maternal responsiveness did have a statistically significant effect on children's use of physical aggression. It is also of interest that the modification index in the multiple indicator model also suggested that the fit of the model would improve with the addition of a direct path from family size to children's use of physical aggression.

Table 16

Maximum Likelihood Estimates for the Effects in Modified Model V: Preschool Children Using Multiple Indicators [a]

Effect		Unstandardized	Standardized	Explained
To	From	Effect	Effect	Variance
Child witnesses intra-family aggression				69.9%
	Intra-family aggression	1.000[b]	0.836[b]	
Maternal responsiveness				7.2%
	Intra-family aggression	-0.172**	-0.091**	
	Maternal age	0.021	0.039	
	Maternal education	0.026*	0.051*	
	Maternal depression	-0.161***	-0.166***	
	Maternal alcohol consumption	-0.026**	-0.077**	
	Family income	-0.045**	-0.081**	
	Family type	-0.019	-0.012	
	Family size	-0.088***	-0.131***	
	Family tension due to alcohol	-0.040	-0.048	

(Table 16 continued....)

Effect *To* From	Unstandardized Effect	Standardized Effect	Explained Variance
Physical Aggression			22.9%
Child witnesses intra-family aggression	0.082***	0.101***	
Maternal responsiveness	-0.033*	-0.065*	
Internalizing behaviours	0.449***	0.423***	
Child gender	0.083***	0.148***	
Indirect aggression			18.5%
Child witnesses intra-family aggression	0.100***	0.117***	
Maternal responsiveness	-0.028*	-0.052*	
Internalizing behaviours	0.436***	0.390***	
Child gender	-0.028*	-0.047*	
Internalizing behaviours			9.1%
Maternal responsiveness	-0.062***	-0.129***	
Maternal depression	0.116***	0.249***	
Child gender	-0.006	-0.011	
Prosocial behaviours			11.1%
Maternal responsiveness	0.221***	0.262***	
Child gender	-0.191***	-0.207***	

Chi square	744.78
Degrees of freedom	168
Probability	.000
GFI	.979
AGFI	.965

[a] $n = 3014$. [b] coefficient fixed.

*$p < 0.05$. **$p < 0.01$. ***$p < 0.001$.

Table 17

Comparison of Maximum Likelihood Estimates for Modified Model I and Model V: Preschool Children [a]

Effect		Model I	Model V
To	From	Standardized Effect	Standardized Effect
Child witnesses intra-family aggression			
	Intra-family aggression	0.836[b]	0.836[b]
Maternal responsiveness			
	Intra-family aggression	-0.078**	-0.091**
	Maternal age	-0.017	0.039
	Maternal education	0.071**	0.051*
	Maternal depression	-0.197***	-0.166***
	Maternal alcohol consumption	-0.035	-0.077**
	Family income	-0.084**	-0.081**
	Family type	-0.025	-0.012
	Family size	-0.108***	-0.131***
	Family tension due to alcohol	-0.066**	-0.048
Physical Aggression			
	Child witnesses intra-family aggression	0.111***	0.101***
	Maternal responsiveness	-0.027	-0.065*
	Internalizing behaviours	0.465***	0.423***
	Child gender	0.124***	0.148***
Indirect aggression			
	Child witnesses intra-family aggression	0.071***	0.117***
	Maternal responsiveness	-0.075**	-0.052*
	Internalizing behaviours	0.351***	0.390***
	Child gender	-0.043*	-0.047*
Internalizing behaviours			
	Maternal responsiveness	-0.095***	-0.129***
	Maternal depression	0.379***	0.249***
	Child gender	-0.010	-0.011

(Table 17 continued....)

Effect	Model I	Model V
To From	Standardized Effect	Standardized Effect
Prosocial behaviours		
Maternal responsiveness	0.309***	0.262***
Child gender	-0.177***	-0.207***
Chi square	193.46	744.78
Degrees of freedom	34	168
Probability	0.000	0.000
GFI	0.992	0.979
AGFI	0.970	0.965

[a] $n = 3014$. [b] coefficient fixed.

*$p < 0.05$. **$p < 0.01$. ***$p < 0.001$.

CHAPTER 10

DISCUSSION

This investigation examined the processes underlying children's responses to witnessing physical aggression in their families using structural equation modeling with data from the first wave of the National Longitudinal Survey of Children and Youth, the first national survey of Canadian children. The model tested two major hypotheses. The first hypothesis tested was that exposure to physical aggression in the family affects children's adjustment because children exposed to aggressive role models learn to behave aggressively (i.e., Cycle of Violence Hypothesis). The second hypothesis tested was that physically aggressive behaviour in families disrupts parent's ability to provide warm responsive parenting and this ultimately affects children's adjustment (i.e., Disruption to Parenting Hypothesis). The study also examined the influence of gender and age on children's responses. The model was estimated separately for preschool (i.e., 4 to 5 years), young school-age (i.e., 6 to 9 years) and older school-age children (i.e., 10 to 11 years).

In addition, the study examined two methodological questions. The study examined whether there was a difference when assessments were based on both maternal and child reports of maternal responsiveness and children's adjustment. The analysis was based on the sample of older school-age children since they were the only children to provide information that replicated the parent's information. An examination of the unidimensionality of the concepts that were measured using scales was also undertaken. This analysis was based on the sample of preschool children.

This chapter includes eight main sections. The first section discusses the processes underlying children's responses to witnessing physical aggression in their families in relation to the two hypotheses tested. Although the models were estimated separately for children in the different age groups, there were more similarities than differences in children's adjustment in the different age groups. Consequently, the findings will be presented together and any differential effects will be highlighted. The second section includes the influence of maternal responsiveness on children's adjustment and discusses social and demographic variables that influence maternal responsiveness. The third section discusses the influence of maternal depression on children's adjustment. The fourth section outlines children's responses to witnessing physical aggression and gender differences in their responses. The fifth section presents a discussion of the clinical and policy implications. The sixth section discusses the

findings from the methodological questions. The concluding sections discuss the limitations of the study and provide suggestions for future research.

Processes Underlying Children's Responses to Witnessing Physical Aggression in Their Families

Results of the model estimations using preschool, young, and older school-age children showed that the theoretical perspectives tested in this modeling exercise provide a reasonable, if only a partial explanation, of how children are affected when they live in families that use physically aggressive behaviour. Although the chi-square values for all three models were still large and statistically significant, this is largely a function of the sensitivity of these statistical tests to the large sample sizes used in these analyses (Bollen & Long, 1993; Hayduk, 1987; 1996; Jöreskog & Sörbom, 1989; Jöreskog, 1993). The other indices of fit were highly acceptable suggesting that the model fit the data reasonably well. Moreover, there was remarkable similarity between all three models (i.e., for all three age groups) in the goodness of fit indices, in the percentage of explained variance of the endogenous variables, and in the majority of the structural coefficients in terms of direction, strength, and significance of effects. The striking consistency between the models provides some evidence of the robustness of the findings and the reasonableness of the theoretical explanation for understanding children's adjustment in families characterized by physical aggression.

The model explained a modest portion of the variance in children's adjustment difficulties. In terms of outcomes, the most explanation was provided for children's use of physical aggression (i.e., 25.5% to 33.6%) followed by children's use of indirect aggression (i.e., 15.1% to 26.9%). Of the three age groups studied, the model for the older school-age children had the greatest explanatory power -- a finding which may be explained by cumulative effects of living in adverse home environments. This is only speculation since the survey was cross-sectional in nature. A longitudinal analysis is needed to provide empirical evidence of cumulative effects.

Despite the fact that there is only a modest portion of the variance explained, there is sufficient reason for optimism. First, there is little research on the processes underlying children's responses to witnessing physical aggression in their families. The only past research identified was Henning and colleagues' investigation (1997) of the role of parental warmth in mediating the responses of young college students to witnessing physical conflict between parents in childhood. The finding in these analyses support Henning and colleagues' finding

that parenting is an important variable in individual's adjustment to witnessing aggression. Second, results were obtained in a representative sample of children living in the community, not from a clinical sample of children in treatment, or a sample of children living in shelters for abused women. The degree of explanation provided by all models is modest yet reasonable. The inclusion of paternal responsiveness, a variable that is pertinent to children's adjustment, may well have led to greater explanation. Other variables (e.g., peer and media influences) may also need to be included to achieve greater explanation.

Support for Cycle of Violence and the Disruption of Parenting Hypotheses

The model suggests that the use of physical aggression by family members does have an impact on children's adjustment through the two mechanisms hypothesized. First, children who witnessed physical aggression more frequently behaved more aggressively themselves. The increase in the use of physical aggression in this investigation occurred for children across all age groups. This finding is consistent with a social learning perspective, which suggests that children learn patterns of behaviour from important role models in their lives and then incorporate these patterns of behaviour in their own behavioural repertoire (Bandura, 1967, 1973). These findings support those of other investigations that found that children exposed to physical aggression in their families behaved more aggressively themselves, both at home and in other settings, than children who were not exposed to physical aggression in their families (Davis & Carlson, 1987; Emery & O'Leary, 1982, 1984; Fantuzzo et al., 1991; Hershorn & Rosenbaum, 1985; Holten & Ritchie, 1991; Hughes, 1988; Hughes & Barad, 1983; Jaffe et al., 1985, 1986a, 1986b; Johnston et al., 1987; Johnson & O'Leary, 1987; Jouriles et al., 1989; Jouriles et al., 1996; Jouriles et al., 1988; Mathias et al., 1995; Porter & O'Leary, 1980; Rossman & Rosenberg, 1992; Smith et al., 1997; Spaccarelli et al., 1994; Sternberg et al., 1993; Westra & Martin, 1981; Weirson et al., 1988; Wolfe et al., 1985).

There was also a significant increase in the use of indirect aggression for preschool children and young school-age children. In older school-age children, there was actually a slight decrease but it was not statistically significant. The reason for this lack of consistency and the importance of this finding is not entirely clear. It is more reasonable to expect that older children would use more indirect forms of aggression since manipulative behaviour requires greater social skills (Björkquist, 1994). As social skills develop, more sophisticated strategies of aggression are made possible. Despite the reasonableness of this assertion, prior research has largely focussed on the influence of gender and ignored the influence of age in the expression of indirect aggression. Furthermore, this particular outcome has not been

studied in children exposed to interparental aggression.

The second major hypothesis that was tested in this model was the disruption of parenting hypothesis. Across all developmental periods, aggression in the family resulted in less maternal responsiveness providing support for the hypothesis that aggression in the family may compromise mother's ability to parent responsively (Belsky, 1984; Davies & Cummings, 1994; Emery, 1989; Emery et al., 1992; Fauber & Long, 1991; Gable et al., 1992; Jaffe, Wolfe et al., 1990; Rutter, 1994; Wolfe & Jaffe, 1991). The effects, however, were only statistically significant for preschool and young school-age children. Nevertheless, there was an interesting pattern in the effects. The effects decreased in strength with each older age group suggesting that intra-family aggression was less disruptive to mothers' parenting when children were older.

As predicted, maternal responsiveness had an impact on various aspects of children's adjustment. Consistently, it influenced children's adjustment in the direction predicted. The results do suggest that alteration in maternal responsiveness due to aggression in the family partially explains children's adjustment difficulties. The findings support the theoretical perspective that parent's responsiveness is partially responsible for children's adjustment difficulties at least where mothers are concerned. This is deemed particularly relevant in light of the fact that several demographic and social variables (e.g., age, education, depression, alcohol consumption, and family tension) shown in previous research to influence maternal responsiveness were statistically controlled in these analyses. In doing so, it was expected that the influence of maternal responsiveness on children's adjustment would be weaker. The fact that the influence remains significant after controlling for so many background variables increases confidence in the findings that the disruption to parenting is clinically relevant.

The Influence of Maternal Responsiveness on Children's Adjustment

Maternal responsiveness influenced several aspects of children's adjustment. Less maternal responsiveness was associated with an increase in children's use of physical and indirect aggression. The effect for physical aggression gained in strength with each older age group. The effect for indirect aggression was fairly consistent in all three age groups. Since there is no previous literature which discusses antecedents of indirect forms of aggression (Crick, 1996), the model provides a first glimpse into an antecedent of indirect aggression.

Less maternal responsiveness was also associated with an increase in internalizing

behaviours in children. Although the influence was generally weak in all three groups, it gained in strength with each older age group (-0.072 in preschool children, -0.103 in young school-age children, and -0.167 in older school-age children). By contributing to children's internalizing behaviours, less maternal responsiveness also indirectly influenced children's use of aggression. Children who were more sad, withdrawn, anxious, and depressed behaved more aggressively using both physical and indirect expressions of aggression.

Finally, less maternal responsiveness was associated with a decrease in children's expressions of prosocial behaviours. This occurred for children across all developmental periods. Less maternal responsiveness, therefore, not only translated into more behaviours that are considered maladaptive but it was also associated with a decrease in behaviours that are generally considered adaptive and are associated with competence in children.

Social and Demographic Variables that Influence Maternal Responsiveness

Of the social and demographic variables included as background variables, maternal education, family size, and family tension significantly influenced maternal responsiveness regardless of the age of the child. The influence of these variables was in the direction predicted by previous research. Mothers who had more education were more responsive to their children, and as expected, family tension was inversely associated with maternal responsiveness. Of particular interest was the influence of family size on maternal responsiveness. In all three groups, large family size was associated with a decrease in maternal responsiveness. While this association was expected, there was something noteworthy in the diagnostic information of the LISREL output that may have relevance in advancing understanding of children's adjustment. According to the diagnostics, the models would improve with the addition of a direct pathway from family size to physical aggression. Family size appears to have a direct effect on children's aggression, an effect that is not mediated by parenting. The modification was not made in these analyses to avoid capitalizing on chance. However, because the modification index suggested this modification in all three models and the expected parameter change in all the models were in the same direction, it is highly unlikely that this change would have capitalized on chance. Although the original intent was simply to control for the influence of family size on maternal responsiveness; the findings strongly suggest that this was an important variable that directly influences children's aggression. Interestingly, Rutter (1995) included family size as a risk factor that significantly increased the likelihood of psychiatric disorders in children when it was present with other risk factors such as severe marital discord and/or maternal psychiatric disorder. Research has

shown that large family size was associated with antisocial behaviour in school-age children (Spaccarelli et al., 1994) and in adolescence (Farrington, 1995). Theoretically, it is reasonable that children's behaviour in large families would be more aggressive than children's behaviour in families with fewer children. If aggression is used as an attention getting device, or as a response to frustration it would be reasonable that this would increase in larger families. It is also noteworthy though that there was a weak but significant correlation between family size and children's witnessing of aggression in their families in the current study ($r = 0.09$ in preschool children, $r = 0.12$ in young school-age children, and $r = 0.20$ in older school-age children). Not surprisingly, large family size has been associated with domestic violence (Gelles & Cornell, 1985; Wolfe et al., 1986).

The influence of the remaining variables on maternal responsiveness varied according to the children's age. Of notable interest is the mother's consumption of alcohol. An increase in alcohol consumption reduced maternal responsiveness for mothers of young and older school-age children. Surprisingly, it did not reduce maternal responsiveness for mothers of preschool children. One possible explanation is that it may be easier to parent younger children while under the influence of alcohol, but harder to parent older children who are more likely to be more demanding and challenging and aware of the parent's drinking behaviour. This is an area that requires further research.

Another interesting finding was that family type, that is whether the family was a single or a two parent family, did not significantly decrease maternal responsiveness in every sample. Single parent status did not adversely affect maternal responsiveness for mothers of preschool or young school-age children. Maternal responsiveness did decrease when mothers were alone to parent older school-age children. This also may be explained by the fact that parenting older school-age children is more challenging. Children aged 10 to 11 years old are in a transition stage to adolescence. They face normative changes biologically, emotionally, cognitively, and socially that result in greater independence and maturity (Collins et al., 1995). These changes, while normative, are often challenging and taxing to parents as they require very different parenting skills and strategies. Parents often have difficulty accepting that they have less influence over their children's behaviour and less control of their outside activities. It is possible that adapting to the changes required in parenting prepubertal children may be more difficult for parents who face the challenge alone.

The Influence of Maternal Depression on Children's Adjustment

Maternal depression significantly reduced maternal responsiveness for mothers of preschool and young school-age children. The influence weakened as children got older. A possible explanation is that younger children require more love, nurturance, emotional engagement and support from mothers. Depression may limit mothers' ability to fulfil these functions. The effects may be less in older children because the demands for these specific aspects of parenting may possibly change as children age.

While the effect of depression on maternal responsiveness decreased as children got older, the impact that maternal responsiveness had on children's internalizing behaviours increased as children got older. The total indirect effect of maternal depression on children's internalizing behaviours mediated through maternal responsiveness were rather small to be considered clinically relevant.

The modified model, however, provided an additional insight into how children are affected by maternal depression that does have important implications. In addition, to the indirect effect of maternal depression on children's internalizing behaviours mediated through parenting, depression had a direct effect on children's internalizing behaviours in all three samples. This was an unexpected finding. Past research has shown that depression impacts on mother's ability to provide warm, responsive parenting. As well, research has also shown that depression results in a general lack of parental involvement, spontaneity, and emotional support in child-rearing (Downey & Coyne, 1990; Field, 1995). Because past research has so clearly demonstrated that parenting behaviours are affected by depression, the original intent in the modeling exercise was simply to control for the effects of depression on maternal responsiveness. However, the diagnostic information in the LISREL output showed that there was a direct effect of maternal depression on children's internalizing behaviours. The inclusion of a direct path between these two variables vastly improved the overall fit of the model in all three age groups. This suggests that depression not only contributes to less maternal responsiveness but it has a direct effect on children's internalizing behaviours. Children who lived with mothers who experienced more symptoms of depression were more sad, withdrawn, and depressed themselves.

Moreover, regardless of the child's age, the direct effect of maternal depression on children's internalizing behaviours was much stronger than the indirect effect mediated through maternal responsiveness. The direct effect of maternal depression on children's

internalizing behaviours was 21 times stronger than the indirect effect in the preschool sample, 27 times stronger in the young school age sample, and 57 times stronger in the older school-age sample. Again, the influence gained in strength as children aged.

Ample research has demonstrated that children of depressed mothers have more adjustment problems (Cummings & Davis, 1994; Downey & Coyne, 1990; Goodman et al., 1993; Gross et al., 1995; Field, 1995). Past research, though, has not clearly articulated the processes underlying children's responses - how children are actually affected by maternal depression. Most scholars suggest that children are affected because of the impact of depression on parenting (Belsky, 1984; Cowan & Cowan, 1993; Downey & Coyne, 1990; Field, 1995; Miller, Cowan, Cowan, & Hetherington, 1993; Webster-Stratton, 1997). The empirical findings in this investigation suggest a need for closer examination of this perspective. Children were far more negatively affected by the direct effect that maternal depression had on their own behaviour than by the indirect effect mediated through parenting.

There are several possible explanations. One explanation is that depression is inherited. Children born to mothers at risk for depression may inherit the biological mechanism that predispose them to depression. Research has demonstrated a genetic transmission of depressive disorders in adults from twin, adoption, and family studies. Support for heritability of childhood depression, however, is less clear than that for adult-onset depression (Goodman & Gotlib, 1999).

Another possible explanation is that the relationship between maternal depression and children's internalizing behaviours is a spurious one -- that the underlying precursor of both is associated with the stress in the family environment. Children of depressed mothers are exposed not only to their mother's depression but to a variety of stressors that are associated with the depression (Goodman & Gotlib, 1999). Consistently, researchers have found that depressed women report more stress in their lives than non-depressed women. In particular, depressed women report more stress in marital relationships. The relationship between marital discord and depression (Beach & Nelson, 1990; Downey & Coyne, 1990; Goodman et al., 1993) and specifically between marital aggression and depression has been well documented in the literature (Campbell et al., 1996; Jaffe et al., 1985, Ratner, 1993; Rodgers, 1994). Children of depressed mothers, sharing the same family environment, most likely are exposed to high levels of marital conflict and/or marital aggression. It is interesting to note that for children in all analyses, there was a low but significant association between maternal depression and the frequency of children witnessing aggression in their families ($r = 0.14$ in

preschool children, $r = 0.12$ in young school-age children, and $r = 0.09$ in older school-age children). Thus, the increased internalizing behaviours in children may be a reaction to the same stressful family environment that is affecting the mother's mental health.

Finally, social learning theory may provide a reasonable explanation for the association between maternal depression and children's internalizing behaviours. Depression is associated with negative cognitions, behaviours, and affect. These traits make the parent an inadequate social partner for the child and unable to meet the child's social and emotional needs. Through social learning or modeling, children acquire cognitions, behaviours, and affect that resemble those of the depressed parent (Goodman & Gotlib, 1999). Children pick up cues from the mother's affect in the same manner that they learn aggressive or other behavioural expressions. Thus, depression may have a modeling effect on children's behaviour -- exposure to a depressive role model affects children's own emotional behaviour. There is considerable support in the literature that children of parents with psychopathology have more adjustment problems themselves (Downey & Coyne, 1990; Goodman et al., 1993; Goodman & Gotlib, 1999; Gross et al., 1995; Field, 1995; Kinard, 1995).

The other possible explanation is a reporting bias in depressed mothers. Several scholars suggest that depressed mothers tend to rate their children's behaviour more negatively than mothers who are not depressed (Chilcoat & Breslau, 1997; Fergusson, Lynskey, & Horwood, 1993; Field, 1995; Richters, 1992; Webster-Stratton, 1988). However, after critically reviewing 22 published studies that claimed distortion bias, Richters (1992) concluded that there was no empirical evidence to support the claim that depressed mothers distorted ratings of their children's behaviours. Further, Chilcoat and Breslau's (1997) study broadened understanding of this phenomenon by comparing mothers' and teachers' reports of children's behaviour to evaluate whether psychiatric history biased mothers' reports of their children's behaviours. These researchers found that mothers with a history of depression reported higher levels of internalizing and externalizing problems than mothers who were not depressed; however, teachers also rated children of depressed mothers as having more internalizing problems than children of mothers who were not depressed. Their results indicate that while there is a reporting bias operating, at the same time, children of depressed mothers do in fact have more internalizing problems than children of non-depressed mothers. Other researchers have found evidence of more behavioural problems in children of depressed mothers when rated by spouses, teachers, and the children themselves (Richters, 1992; Fergusson et al., 1993).

Children's Responses to Witnessing Physical Aggression in their Families

Children in families who use physical aggression to resolve conflict responded by displaying more physical and indirect forms of aggression, more internalizing behaviours, and less prosocial behaviours. All of these responses are known to be detrimental for children's well-being. The consequences of aggression for children's development have received the most attention by researchers. Aggressive children have difficulty understanding the perspectives, feelings, and intentions of others. Consequently, they are more likely to be unpopular, often isolated or rejected by their peers (Feshbach, Feshbach, & Jaffe, 1997; Rubin et al., 1995). They have more academic difficulties (Tremblay et al., 1992). Moreover, children's problems often continue since aggression is likely to be stable throughout the childhood years and predictive of later antisocial behaviour especially delinquency (Campbell, 1995; Rubin et al., 1995; Tremblay et al., 1992).

Far less is known about the developmental outcomes for children with internalizing behaviours than for children with externalizing behaviours. Since clinicians and researchers believed that these problems were more transient in nature than problems typically associated with under-control, there is less research on internalizing problems in children. Although less is known about the origins, antecedents, and correlates of internalizing behaviours, what is known does not bode well for children's future. For one thing, there is remarkable stability in problems of this nature. Internalizing problems starting in childhood tend to persist into adolescence. They make interactions with others difficult and contribute to distant and difficult relationships. Since children fail to develop the interactive skills necessary for healthy relationship experiences, it precludes children from having positive experiences with others. This factor that may well interfere with their ability to find a positive supportive relationship experience with another individual, a factor known to protect children in high risk homes from adversity (Jenkins & Smith, 1990; Rutter, 1995; Werner & Smith, 1992; Wolak & Finkelhor, 1998).

The fact that even preschool children showed evidence of internalizing behaviours is alarming. It is not commonly expected that children so young will display these symptoms (Campbell, 1995; 1997). One possible explanation may be related to developmental factors. Preschool children are especially likely to feel responsible for problems in their families because of their egocentric thinking, as well as, their inability to view things from the perspective of others (Jaffe, Wolfe et al., 1990). Since internalizing problems are more difficult to identify in young children than externalizing problems, and partly because clinicians

have been reluctant to diagnose problems of this nature in very young children, less is known about internalizing behaviours in children this young (Campbell, 1995, 1997; Rubin & Mills, 1991; Rubin et al., 1995). Nevertheless, research has shown that the earlier a child has problems of this nature, the more likely they are to persist and influence the child's later behaviour and the more resistant they are to therapeutic intervention.

In these analyses, an increase in internalizing behaviours resulted in an increase in children's use of physical and indirect aggression. It is not surprising that children with internalizing problems will act out and hurt others. Depression, sadness, and withdrawal are behaviours which are self-directed (Feshbach et al., 1997). Aggressive behaviour is behaviour that is directed outward toward individuals or objects. Depression is a counterpart of aggression - it is anger turned inwards. As a response to coping with sadness, withdrawal, and depression, children may eventually take out their frustrations on others. The fact that internalizing behaviours was associated with aggression, though, may jeopardize children's chances of having their internalizing problems diagnosed. Externalizing behaviours are far more visible and demand more immediate attention which may interfere with parents' and clinicians' recognition of the anxiety and depression underlying their behaviours (Rubin & Mills, 1991). Ultimately, this means that internalizing behaviours are more likely to go undetected with negative consequences for children's well-being.

While aggressive behaviours and internalizing behaviours represent two facets of maladjustment in children, prosocial behaviours generally represent adjustment in children.[18] To date, the effects of witnessing intra-family aggression on children's development of prosocial behaviours have not been studied. Findings from this study showed the expression of prosocial behaviours was in part determined by maternal responsiveness. Less maternal responsiveness was associated with less prosocial behaviours in children.

This has important implications for children's social development. Prosocial behaviours are associated with the development of empathy (Feshbach, 1982; Eisenberg & Mussen, 1989), altruism (Zahn-Waxler & Yarrow, 1982), perspective-taking (Eisenberg et al., 1997); moral reasoning in children (Eisenberg, 1982), acceptance and popularity with peers and success in school (Caprara, Barbaranelli, Incatasciato, Pastorelli, & Rabasca; 1997).

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[18] There is a balance between too little prosocial behaviour and too much as when children take on undue responsibilities that are inappropriate for their age. This is commonly seen in the children of alcoholics. In this sense, excessive prosocial behaviours can also be dysfunctional (Hay, 1994).

Interestingly, Caprara and colleagues (1997) found that prosocial behaviour was a more important predictor of peer acceptance and academic success than measures of aggression and emotional instability for school-age boys and girls. Likewise, Crick (1996) found that prosocial behaviour contributed unique information to the prediction of children's future social adjustment beyond that provided by both physical and indirect aggression.

All of the outcomes examined in this study have serious implications for children. Behavioural patterns characterized by high levels of aggression combined with low levels of prosocial behaviour may be particularly problematic for children. Children who are aggressive and who lack prosocial skills may be particularly at risk for social adjustment difficulties (Caprara et al., 1997; Crick, 1996; Rubin et al., 1995). Children with these behavioural patterns have difficulty establishing peer relationships which may have serious consequences for their sense of well-being.

The Influence of Gender in Children's Responses

Gender influenced children's responses to witnessing physical aggression in their families. Across all developmental periods, boys were more physically aggressive than girls of the same age. This finding is consistent with several studies of children's responses to witnessing interparental aggression in shelter samples of children of battered women (Jaffe et al., 1986a; Hughes, 1988; Reid & Crisafulli, 1990) and consistent with research on behaviour problems in children in the general population (Boyle et al., 1987; Thomas et al., 1991; Offord et al., 1989). One possible explanation for the greater expression of physical aggression in boys is identification with the aggressor who is most often the male in the family. It may also be explained by differences in socialization practices common in North American society (Lytton & Romney, 1991). Socialization practices which start in infancy typically encourage and support the use of physical means of expression in boys and discourage them in girls (Keenan & Shaw, 1997; Lytton & Romney, 1991; Miedzian, 1995).

Across all age groups, girls used more indirect forms of aggression than boys of the same age. This finding is supported by previous research of girls in the general population (Björkqvist, 1994; Grotpeter & Crick, 1996). There is no empirical support for this finding in the literature examining children's responses to witnessing interparental aggression because this outcome has not been previously studied in this context.

In all three developmental periods, gender influenced children's use of prosocial

behaviours. Boys displayed less prosocial behaviours than girls of the same age. Generally, past research has reported more prosocial behaviour in girls than boys (Underwood & Moore, 1982; Hay, 1994; Feshbach, 1982). This finding may also be explained by socialization practices. Prosocial responses must be available in the child's repertoire for the child to act in a sociable manner. From an early age, girls are socialized in helping and sharing behaviours (Feshbach, 1982; Keenan & Shaw, 1997). Parents encourage daughters more than sons to relinquish toys to peers, take another's perspective, and treat others with kindness. Parents are also more likely to respond positively when their daughters demonstrate these behaviours which serves to reinforce them (Kerig et al., 1993). Another possible explanation is developmental maturity. Relative to boys of the same age, girls are more biologically, cognitively, and socially advanced than boys (Keenan & Shaw, 1997). The use of prosocial behaviours, which demonstrate social competence, would thus be expected to be greater in girls than boys of the same age.

The child's gender did not influence internalizing behaviours for children in any age group. Results of previous work on the influence of gender in children's responses to witnessing interparental aggression have been inconsistent. There was, however, no evidence of gender differences in internalizing behaviours in the Ontario Child Health Study which assessed behavioural problems in a community sample of school-age children (Offord et al., 1989). Rates of internalizing behaviours were similar for the two sexes. Gender differences in internalizing behaviours typically emerge by adolescence with girls displaying more internalizing problems than boys of the same age (Campbell, 1995; Rubin et al., 1995).

Clinical and Policy Implications

The findings from this investigation have a number of clinical and policy implications that cover a broad spectrum. These can be broadly characterized into efforts to prevent the use of aggression in families and interventions to ameliorate the negative outcome for children. The following section first discusses prevention strategies and then discusses intervention strategies.

Prevention Efforts

First and foremost, since children are adversely affected when family members use physical aggression toward other family members, this relationship demands sincere and determined efforts to prevent the use of aggressive behaviour in families. Because the use of

aggression in families is prevalent in society, crossing all cultures and socioeconomic classes, prevention efforts are needed that access the public at large and serve to change public attitudes about the appropriateness of aggressive behaviour in families. Ultimately, it is only when society rejects the notion that any type of aggression in families is permissible that societal attitudes will begin to change, people's behaviour will change, and people will more readily seek assistance for these problems. People are still reluctant to reveal these family secrets because of strong societal attitudes that preserve the sanctity of the family.

Raising awareness of the link between children's exposure to aggression and adjustment difficulties should be incorporated into prevention efforts. Parents concerned with their children's behaviour problems may not be aware of the influence of the family environment on their children's behaviour. Awareness itself may result in parents' effort to change their behaviour or the family environment. Concerns for the safety and well-being of children are often the impetus for parents to change negative behaviour or for women to leave violent relationships (Henderson, 1990; Hilton, 1992; Humphreys, 1993b). Consequently, information about the effects on children can help women and/or families in their decision making process.

Finding that children are also affected because aggression in the family environment disrupts mothers' ability to provide warm, responsive parenting has an important implication. Parents need to know that even if it is possible to protect children from actually witnessing the aggressive incidents, they cannot ultimately protect children from the negative sequelae of living in adverse family environments. Children will still be negatively affected in families even when they are shielded from exposure because of the effect that aggression has on parenting practices and maternal depression. This should be discussed with parents in a non-judgmental and non-threatening manner.

The media is frequently used in prevention efforts and has been particularly effective in other major educational campaigns (e.g., antismoking campaigns, drunk driving campaigns). Utilizing multi-media campaigns to increase awareness of the effects of marital conflict, especially marital aggression, on children would be an effective medium to reach a wide audience. Ads should be aimed primarily at reaching adults to increase their awareness about children's responses to witnessing aggressive behaviour in families. In addition, there should be ads marketed directly to children. Since children who grow up in violent homes tend to view violence as a normal response to anger or frustration (Miedzian, 1995), they need help to understand that violence is not an appropriate way to resolve conflicts. They also

need to know that they are not the only children to have witnessed violence in their homes. Perhaps, prevention strategies aimed at helping the children understand that the behaviour they are witnessing is not normal or appropriate may encourage children to disclose the information to professionals such as nurses, physicians, teachers, counsellors or other adults that they have contact with. At the least, it may encourage children to share their experience with outsiders.

Children's Education

Another avenue to access large numbers of children, in a captive audience, is through the educational system. Jaffe, Wolfe and Wilson (1990) contend that "only a major commitment by school systems to address this problem can lead to any meaningful changes" (p. 112). Educational programs for school-age children, beginning in kindergarten, should be used for family violence prevention education. A variety of programs exist that include such strategies as affective education (i.e., teaching children to recognize and labels feelings), skills education (i.e., teaching children conflict resolution, anger management, and problem solving ability), family life education (i.e., preparation for parenthood) and family violence education -- including safety skills for children (Gamache & Snapp, 1995). Although there is increasing attention given to these prevention programs in many school systems, they need to be taught by school systems in all jurisdictions.

Professional Education

An emphasis on the effects on children of witnessing intra-family aggression should be emphasized in family violence education taught to all professionals who treat, support, or assist families. Family violence education should be taught to a wide range of professionals including nurses, physicians, dentists, physiotherapists, occupational therapists, chiropractors, community health workers, social workers, child protection workers, psychologists, counsellors, teachers, child care workers, policy makers, lawyers, police officers and any other professionals who work in the area of or are interested in family violence. Prevention truly requires a concerted and multidisciplinary effort if violence is ever to be eradicated in society.

Family violence education should be taught early in the educational curriculum of professionals in practice professions so that practitioners feel comfortable approaching the subject of violence in families. Nurses as well as other health professionals are often reluctant

to broach the subject with families. The most effective method of reducing individual's reluctance is through education. However, most curriculum currently only include a cursory knowledge of the subject. According to the Campbell, Chapman, Chapman, Page and Sheridan (1998), members of the Nurses Task Force on Violence Against Women, most schools of nursing in the United States only include one to two hours of family violence education and few offered clinical experiences. Though there are no similar statistics available for nursing education in Canada, MacKay (1992) found that most Canadian graduates from human service professional schools were not provided with the skills necessary to assist abused women. There is every reason to believe that there is even less preparation for nurses related to the needs of children who are exposed to aggressive behaviour in their families since the effects on children of witnessing violence were recognized much later than the needs of abused women. Echlin and Marshall (1995) maintain that there should be *legislation* mandating education and training of child protection workers so that they understand the impact of witnessing aggression on children. Mandating family violence education for all professionals may be a drastic but innovative approach that would ensure a minimum level of knowledge for professionals who assist families.

In practice professions, educational preparation should include clinical experiences to reinforce knowledge learned in the classroom. Students only exposed to lecture material do not develop the comfort level needed to assess for violence in families, the expertise to know how to intervene, and the empathy needed to be therapeutic. Indeed, in a recent study of abused women in Canada, Ratner (1995) found that women did not find nurses or physicians particularly helpful and only sought their support when they had sustained severe injuries. While it is clear from research and clinical observation that women want health professionals to ask about violence in families (Campbell, 1993, 1998; Humphreys, 1993a, 1993b), generally women perceive that they have been poorly served by these professionals. The most effective method to promote responsive nursing intervention in families who experience violence is to make content on family violence an integral part of the nursing curricula at the undergraduate and graduate levels of education and to facilitate students obtaining related clinical experience.

Nursing's Role

The prevalence of violence in families is recognized as a major public health concern. Nursing is in a unique position to contribute to prevention. Nursing's broad access to people in the community, potential to interact with individuals/families at every stage of the life cycle,

and strong emphasis on health promotion offers much potential to take a proactive role in preventing the use of aggression in families.

Nursing Assessment

Assessment for family violence is not currently a routine part of health assessment. Nurses should routinely include an assessment for family violence when they take histories and health assessments from children, women and/or families. When assessments are conducted routinely and universally to all clients, this communicates to clients that nurses consider this an important and acceptable issue to discuss with health care providers (Campbell, 1993, 1998; Humphreys, 1993a, 1993b). Generally, public and community health nurses have been less involved in identifying and responding to victims of family violence than acute care and emergency room nurses (Hanvey & Kinnon, 1993). Nurses in every area of practice should utilize all opportunities to assess for family violence such as during prenatal visits, well-child clinics, home visits, school visits, and hospital admissions.

Parents often turn first to nurses, family physicians, or pediatricians when they have concerns about their children's behaviour or development providing health professionals with a rich opportunity to intervene and make a difference in children's lives. Clinical assessment must consider the role of intra-family aggression and depressive symptomology in the parents in order to understand contributing factors in children's problems. Simply providing parents with strategies to deal with behaviour problems without this comprehensive assessment will do little to help the child or the family. Intervention strategies are likely to be counterproductive in situations where family violence is present and these risk factors are not accurately assessed.

This study showed that children who are internalizing are also behaving more aggressively. Children's tendency to respond to the stressors in their lives with externalizing behaviours may interfere with parent's and clinician's recognition of the anxiety and depression underlying their behaviours (Jouriles & Norwood, 1995). Externalizing behaviours are far more visible and demand more attention. Internalizing behaviours are more likely to go undetected with negative consequences for children's well-being. This suggests a valuable place to intervene in order to sensitize parents and clinicians to children's distress. It is vital that nurses and other providers assess for internalizing problems when children are aggressive. Nurses and other providers should assess for these symptoms in both boys and girls, and even in young children. Although it is not commonly expected that young children will have these

symptoms, this study found that even preschool children showed symptoms of sadness, withdrawal, and depression. Neither is it commonly expected that boys will have symptoms of internalizing problems. It is more common to think that girls are the *worriers* while boys are the *warriors* (Zahn-Waxler, 1993). This prevalent belief was not supported by the data. In the age groups studied in these analyses, gender did not influence children's internalizing behaviours.

Nursing Interventions

While findings in this investigation suggest that interventions aimed at increasing maternal responsiveness and decreasing maternal depression hold promise for reducing children's adjustment difficulties, it must be stressed that attention must be directed at the underlying reason for the reduced maternal responsiveness and maternal depression. *The processes that are most likely to safeguard children from the negative impact of maternal depression and less responsive parenting may well be the same factors that protect women from developing depressive symptoms and from disrupting their parenting practices in the first place (i.e., decreasing marital conflict and marital aggression).* Simply attempting to increase maternal responsiveness and decrease maternal depression, symptoms of an underlying problem, through traditional approaches will not be effective when the cause of these symptoms is ignored by health professionals. Practitioners need to provide counselling and support to these women, in addition to providing strategies to improve their parenting skills and/or alleviate their symptoms of depression.

Nurses have many opportunities in various settings to teach skills that promote effective parenting and/or to refer parents to parenting courses especially geared to parenting pre-school and school-age children. Nurses can refer clients to home visitation programs and/or community-based parent support groups. Community-based parenting programs are often helpful to mothers not only for learning effective parenting strategies but for the support received from other mothers in the group who are often coping with the same adverse conditions at home (Onyskiw, Harrison, Spady, & McConnan, in press).

Professionals need to explore the underlying reasons for maternal depression and the possible relationship of depression with marital conflict and marital aggression. Professionals should suspect interspousal aggression in women who are depressed and ask their clients about it. Helping women understand in a non-judgemental manner that maternal depression has a negative impact on children may encourage women to seek treatment/counselling or

make other alterations in their lives since women are often motivated by concerns for the well-being of their children (Humphreys, 1995.) Although women generally seek treatment more readily than men, Newman (1994) found that only 28.1% of people who had a diagnosable mental disorder sought help from some professional. Likewise, Arboleda-Florez (1995) found that over half of medically depressed people never sought help. One reason that individuals may be reluctant to seek treatment/counselling for this problem, despite the fact that it is so prevalent a disorder in adulthood, is because it is still very stigmatized in our society (Newman, 1994). Another reason may be related to the fact that depression results in lethargy, apathy, and the inability to make decisions and act on them. Nurses who take the time to establish rapport, listen, and validate their client concerns, in a non-threatening caring manner can help women develop insight into their problems and help them to seek the assistance they need to cope with this debilitating disorder. Nurses can encourage women to seek professional help by referring them for counselling with professionals who are sensitive to the needs of women. Professionals need to be aware of the strong association between marital aggression and depression in women so that appropriate treatment will be provided. Although pharmacological treatment may potentially be used in the treatment of women who are depressed, the advantages and disadvantages of using pharmacological agents with abused women who are depressed has not been evaluated (Campbell et al., 1996). Clearly, it should not be the sole choice of treatment for any individual afflicted with this disorder.

The use of alternate caregivers for children is also an intervention that should be explored since this study found that the direct effects of depression on children were much greater than the effects mediated through parenting. The fact that children were more affected by the direct effects of depression than the effects mediated through parenting behaviours provides a compelling argument for the need for nurse home visitation programs.[19] Depending on the home environment and the child's relationship with the father, support from fathers may also be an important resource for children with a depressed mother. Consistently, research has demonstrated that an important protective factor for children at risk for emotional and behavioural problems is a warm relationship with at least one parent. A warm relationship with a grandparent, an older sibling, or another adult has the same positive effect on children (Egeland, 1988; Jenkins & Smith, 1991; Rutter, 1987, 1995; Werner & Smith, 1992).

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[19] It also provides a convincing argument to justify the need for highly qualified school teachers and day care workers who may provide children from adverse home environments with supportive role models.

Nurses and other professionals can refer children and/or families for counselling. Interventions ideally should involve an integrated approach that would involve work at multiple levels, including the child, the parent subsystem, and the entire family. Findings in this study suggest that the impact of intra-family aggression on children's adjustment is partly explained by a modeling effect and partly mediated through alterations in parenting practices. The implication of this finding is that interventions to alleviate children's adjustment difficulties should ideally include both family and individual therapy for the child (Fauber & Long, 1991). The highest priority is to stop the aggression in families that is impacting on children's adjustment difficulties. Family involvement in treatment may be the best method to achieve that end in families that experience only periodic and minor forms of violent behaviour. Parents who can successfully resolve their conflicts would provide positive role models of problem-solving for their children that may result in improved child outcomes (Fincham & Osborne, 1993).

Nevertheless, it is questionable if family-based therapy is an appropriate choice for some families because the power imbalance that exists in most violent homes limits women's opportunities to speak freely and participate equally in therapy. The stark reality is that some members of families with more severe forms of violence, chronic violent behaviour, or intractable family conflict will not change their behaviour, particularly behaviours that occur in the privacy of their own home. Attempting to force parents into treatment might be unsuccessful or unproductive when parents are not equal partners in the marriage. Other families may not be willing to define the problem as a family problem and not prepared to engage constructively in the therapy process. Still other families do not respond to treatment. In families with multiple problems (i.e., marital distress, spouse abuse, lack of supportive partners, maternal depression, poor problem-solving ability, and high life stress) there are often fewer treatment gains (Webster-Stratton, 1997). In these situations, interventions with the child may be the best alternative. This will provide children with a therapeutic environment safe from their stressful home environment, as well as an opportunity to share and gain insight about their experiences and develop more effective coping strategies (Fauber & Long, 1991). Children should also be helped to develop some safety skills to prepare them for future family crises (Jaffe, Hurley, & Wolfe, 1990).

Child therapy may be the most promising strategy for averting future long term problems. While negative parental behaviour helps establish and maintain a pattern of childhood aggression, and provides a strong foundation for the development of problems in later life, it is the child's early behaviour that is the best predictor of later behaviour (Rubin

et al., 1995). Therapy may help children develop resiliency and buffer them from the harmful effects of living in adverse situations (Jenkins & Smith, 1990; Werner & Smith, 1992). This may help interrupt the intergenerational transmission of maladaptive behaviours. Recently, children exposed to spouse abuse have begun to receive therapeutic intervention in various programs though provincial social service programs. In addition, 53% of shelters in Canada offer programs for children who have witnessed or experienced violence in their homes (Trainor, 1999). Ideally, there should be programs for children in all shelters.

Legislations exists in some provincial jurisdictions in Canada to remove children from homes to protect their well-being. This is included in legislation for child abuse. Six provinces stipulate that a child who has witnessed domestic violence can be found in need of protective services. In Alberta, the legislation states that "a child is emotionally injured if there is reasonable and probable grounds to believe that the emotional injury is the result of .... exposure to domestic violence or severe domestic disharmony (Child Welfare Act Alberta, 1984, p. 2-3.). Similar legislation exists in Saskatchewan (Family Services Act Saskatchewan, 1978), Prince Edward Island (Family and Child Services Act, 1988), New Brunswick (Family Services Act New Brunswick, 1980), Nova Scotia (Children and Family Services Act Nova Scotia, 1990), and Newfoundland (Child Welfare Act Newfoundland, 1990). Nevertheless, there has been inconsistent use of these alternatives and skepticism about whether they are always in the best interests of the child or the child's mother (Echlin & Marshall, 1995). The decision about whether this is optimal is individualistic and dependent on many factors but the best interests of the child should always take precedence -- children have a right to be protected from harm.

Methodological Implications

Difference Between Maternal and Child Reports

As the primary caregivers, mothers are typically the chief historians of children's developmental milestones, medical history, emotional and behavioural problems. Consequently, they are most often asked to provide information on their children. Most research on the effects of witnessing interparental aggression on children's adjustment have relied on mothers to provide information on their children's adjustment. This is similar to other studies on children's functioning/behaviour problems in other populations. Numerous researchers though, have noted problems with maternal ratings (Achenbach, McConaughy, & Howell, 1987; Chilcoat & Breslau, 1997; Eisenstadt, McElreath, Eyberg, & McNeil, 1994;

Hinshaw, Han, Erhardt, & Huber, 1992; Ines & Sacco, 1992; Jenkins & Smith, 1991; Kinard, 1995, 1998; Kolbo & Kazdin, 1993; Lee, Elliott, & Barbour, 1994; Loeber, Green, Lahey & Stouthamer-Loeber, 1991; Richters, 1992; Sternberg et al., 1993). When mother's ratings are compared to other informants such as fathers, teachers, observers, or the children themselves, the correlations are usually only low to moderate in strength. In a review of 119 studies, Achenbach and his colleagues (1987) estimated that the average correlation between ratings of emotional and behavioural problems for all types of informants ranged from 0.20 to 0.30. The low correlations imply considerable disagreement between reports of child behaviour by different sources. The findings in the analyses estimated using both mother and child reports support those of other investigations reporting divergence between parent and child reports (Jenkins & Smith, 1991; Kinard, 1998; Sternberg et al., 1993). The failure of the model to fit the data using structural equation modeling provided a more demanding test of the lack of correspondence. Clearly, had the parent's and child's reports been more highly correlated, the model would not have fit so poorly.

There are a number of reasons that possibly explain the divergence in reports. Divergence has generally has been explained by situation specificity when two raters describe children's behaviour in situations governed by different social expectations. Parents and teachers typically assess children's behaviour in different situations. However, the lack of agreement between mothers and children in the current analyses cannot likely be explained by situation specificity since both the parent and the child were home when they completed the measures. Neither can the disagreement be explained by differences in the measures used. There is remarkable similarity in the content and number of items in four of the five scales completed by both raters. With the exception of the parenting scale, the wording in the remaining scales were almost identical. For example, one item in the parental report of physical aggression states "he/she physically attacks people" while the corresponding item in the child's self-report states "I physically attack people". Thus, with the exception of the pronoun that begins each sentence, identical wording was used. On the other hand, despite the similarity in content, only the child is aware of the intentions of his/her own behaviours. This may have resulted in different interpretations of the items and therefore different responses. Thus, the difference between raters may be a result of this methodological artifact.

Bias in reporting is often used to explain divergence. Women who suffer psychopathology or who are distressed tend to rate their children more negatively than

women without these difficulties[20] (Chilcoat & Breslau, 1997; Fergusson et al., 1993; Gross et al., 1995; Kinard, 1995, 1998). Mothers in the current analysis, however, did not over-report problems in their children. Although mothers rated their own behaviour as less responsive than their children, for all other measures (i.e., child adjustment measures) the children rated their own adjustment difficulties higher than the mothers.

Discrepancies may also exist because mothers may want to deny their children's adjustment difficulties as part of the denial that problems exist in the family. Family violence, though more overt than in past generations, is still shrouded in family secrecy. It is possible that mothers are under-reporting problems in their children to conceal family problems.

It is also possible that there are discrepancies because certain behaviours are harder for parents to observe. Some behaviours may be too subtle and too dependent on self awareness for another individual to rate. It is quite possible that children have feelings of sadness, anxiety, and isolation without parents being aware of these feelings. In the literature on children's behaviour problems, there is generally more divergence between parent and child reports for internalizing behaviours than externalizing behaviours (Achenbach et al., 1987; Boyle, 1991; Kolbo & Kazdin, 1993). Mothers may well be more attuned to disruptive behaviours than internalizing behaviours which are more subtle.

While all these reasons may explain some of the divergence, the most likely explanation is that perceptions of the same construct differ between parents and children. The fact that the model did not fit the data when both parent and child measures were used provides empirical evidence that both participants were reporting a different version of reality. The three models for the different age groups, tested using only information provided by the parent, fit the data reasonably well. If the correlations between the parent and child were higher, the double indicator model would also have fit the data. It did not fit the data because parents and children interpreted the items differently. This underscores the importance of obtaining reports from multiple informants in order to understand children's adjustment difficulties more fully.

Researchers have devoted considerable effort to determining which report is accurate

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[20] While depressed mothers do rate their children more negatively than other raters, evidence suggests that children of depressed mothers have more behaviour problems than comparison children (Chilcoat & Breslau, 1997; Gross et al., 1995; Kinard, 1995, 1998).

-- the gold standard by which to measure children's adjustment difficulties. Children's reports are usually viewed as less accurate than adult reports. The strategy used to estimate the model in this analysis made an explicit assumption that the parent's indicator was the most accurate because this indicator was fixed while the child's indicator was left free to be estimated. This forced the meaning of the concepts to take on the meaning of the parent's indicator and then compared the child's indicator to the parent's indicator. In other words, the model assumes that the child is reporting on the same behaviour that the parent reported on. Despite the use of this analytic strategy, it is not possible to determine whether the parent or child provided the most accurate rating because the alternate approach (seeing whether the parent could report on the same behaviour that the child reported on) could have been used. Statistically, the fit of the model should have been the same, although the structural coefficients within the model may have differed. The model would still have failed. The model failed because the meaning of the concepts were different to each informant suggesting that each person provided a unique viewpoint regarding children's adjustment. This implies that there is no gold standard by which to compare ratings.

The findings have important implications for research and clinical purposes in terms of assessing children's behaviour problems. As Achenbach and colleagues (1987) contend multiple informants should be used because diverging perspectives provide unique information. Children's reports often contribute unique variance relative to adult informants (Kolbo & Kazdin, 1993). Obtaining information from both parents and children would therefore lead to greater understanding of children's adjustment. Although the correlations were low in this analysis, they were still large enough that they should not be ignored. It is evident that both parent and child are reporting on their version of reality - a reality that is only shared to a minimal extent. Thus, parents and children should be modeled separately to increase understanding of the effects of witnessing intra-family aggression on children's adjustment from the perspectives of both parents and children.

Measurement Using Scale Data

The National Longitudinal Survey of Children and Youth followed an ecological and holistic approach to measuring child development. To capture children's development required measuring a large number of very complex variables. Because of the complexity of some concepts measured in the survey, scales were used. This was based on the assumption that a single item is often insufficient to measure the factor or concept with precision (Statistics Canada, 1997; Waltz et al., 1991). For similar reasons, the total score of scales

were used as single indicators in the modeling procedures.

All scales in the NLSCY data set were subjected to a factor analysis by Statistics Canada. The factor analysis provided some analytic evidence of the similarity of items in each scale. Statistics Canada retained only those items that loaded on the same factor. However, factor analysis evaluates measures in isolation from one another, it examines measures of each construct separately. For this reason, this method of validation has limitations. Measures that appear satisfactory in isolation may perform poorly in the context of the substantive theory being tested (Fornell & Yi, 1992). Researchers (Hayduk, 1987; Ratner et al., 1996) have noted problems with this approach because scales often measure more than one underlying concept. For this reason, the last model used single items from each scale to determine whether the presumed unidimensionality would hold under the intense scrutiny of structural equation modeling.

Evidence from the estimation procedure (i.e., Model V) suggested that while the scales used in these analysis were not perfect measures of the underlying concepts, they performed satisfactorily. The results of the model estimated using single indicators composed of the total scores of scales and the model estimated using multiple indicators were similar. It should be noted, however, that the measurement model used only two or three items from each scale rather than all items in the scale. Still, the fact that the results from the multiple indicator model support the single indicator model estimated with the total score of each scale is encouraging. It does provide some evidence that while the scales were not truly unidimensional, neither were they so poor that they affected the overall results. Despite the optimism, it is also clear that the measurement of these concepts needs to be refined. Conducting research with instruments that contain so much artifact limits researchers' ability to maximize the potential of statistical analyses.

There is one option that was not explored in these analyses. There continues to be many questions related to the ideal approach to model development and testing. One controversial issue is whether to approach SEM using a one or two step procedure. In the two-step procedure, advocated by methodologists such as Jöreskog (1993) and Anderson and Gerbing (1988, 1992), the structural model and measurement model are estimated separately. The measurement structure, isolated from the structural part, is first estimated using confirmatory factor analysis. The results provide information to modify the measurement model. Individual items can be added or deleted or even whole scales discarded. Once an acceptable measurement model is found from a series of respecifications, the theoretical

model is then estimated. The criticism of this approach, advanced by Hayduk (1996), Fornell and Yi (1992) and Ratner, Bottorff, and Johnson (1998) is that the separation of theory and measurement is an artificial one because measurement is itself *theory-laden*. Hayduk (1996) advises methodologists to specify and estimate the measurement and structural aspects of the model simultaneously from the beginning of the modeling exercise. This forces researchers to make explicit their conceptualizations rather than merely relying on factor analytic techniques to determine the dimensionality and nature of their concepts. For this reason, the one-step approach was used in this study.

Suggestions for Future Research

There is sufficient research that has demonstrated that the family context, in particular a violent marital relationship, negatively influences children's adjustment. Detrimental effects have been documented in young children, older children, and adolescents. The long term effects are beginning to be understood as researchers have now studied the effects of a negative family environment on college students' adjustment. These studies, though, have all been cross-sectional. Consequently, the cumulative effects of witnessing aggression on children remains poorly understood. Longitudinal research would provide insight into the cumulative effects of witnessing aggression over time. Since the National Longitudinal Survey of Children and Youth will follow the same children for 20 years, it provides a unique opportunity to examine the cumulative effects of witnessing intra-family aggression in children as well as to study how environmental factors interact with developmental factors to influence children's adjustment. This information will advance knowledge in this area.

More research is needed that examines the processes underlying children's responses to witnessing marital conflict and/or aggression that tests alternative hypotheses. This information will advance knowledge in this area of research and will help practitioners develop intervention and treatment strategies needed to assist vulnerable children.

Future research is needed to address the role of paternal responsiveness in children's adjustment difficulties in families characterized by aggression (Wolak & Finkelhor, 1998). Past research has shown that father's parenting is important to children's normal development. There are several reasons to expect that fathers have more influence than mothers especially in relation to children's externalizing behaviours. Men typically exhibit more externalizing behaviours than women in general (Rothbaum & Weisz, 1994) partly because of socialization practices common in our society. Fathers play a very prominent role

in discipline (Lamb, 1981; Parke, 1995, 1996; Starrels, 1994) and typically use more forceful childrearing techniques than women (Power & Shanks, 1989; Simons, Whitbeck, Conger, & Wu, 1991). Phares (1993) showed that college students perceived that fathers were more responsible for externalizing behaviours although mothers were more responsible for internalizing behaviours and both parents shared responsibility for prosocial behaviours. Further, in a review of clinical research, Phares and Compas (1992) found that children's externalizing behaviours were linked to maladaptive paternal characteristics. Moreover, several researchers found evidence of a greater impact of the marital relationship on father's parenting than on mothers (Belsky et al, 1991; Brody et al., 1996; Cowan & Cowan, 1992; Owen & Cox, 1997). Consequently, understanding paternal contributions to children's adjustment would advance knowledge in this area.

Further research is needed to understand how family size influences children's aggressive tendencies. It was clear from these analyses that the number of siblings in the family is associated with an increase in children's use of physical aggression.

This study tested the effects of parental behaviour on children's adjustment and thus the model assumed a unidirectional causal flow. The rationale for this decision was that the objective of the study was to understand how family/parent variables influence child variables. In the vast majority of studies in the parenting and family violence literature, the same causal flow is assumed. Despite this, there is continued debate in the literature about the direction of effects, especially as they relate to externalizing problems in children (Grych & Fincham, 1990; Rutter, 1995; Snyder, Klein, Gdowski, Faulstich, & LaCombe, 1988). Children with externalizing behaviours may discourage parents efforts to be accepting and responsive to their needs (Rothbaum & Weisz, 1994). Aggression in children is likely to be met with less parental responsiveness. In the current analyses, the diagnostic information in the LISREL output did suggest that children's aggression had an effect on parents. Yet, reciprocal pathways were not included in the modified model because other modifications still made more of a contribution to understanding children's adjustment. Nevertheless, questions concerning the direction of influence and causality remain. While it is apparent that parents and the family environment probably exert a more substantial effect on children than children do on parents, investigating reciprocal effects would provide a more holistic picture of family behaviour.

In addition, since much of the research in this area has traditionally focussed on the correlates of problems or pathology, another direction for future research is to focus on

factors that promote resiliency in children. It is apparent that not all children exposed to aggression have adjustment problems since several researchers found no evidence of disturbance in some children exposed to aggression in their families (Jouriles et al., 1989, Wolfe et al., 1986). Protective factors (e.g., warm relationship with one parent, family support) buffer some children from the harmful effects of witnessing intra-family aggression (Kolbo, 1996). Protective factors have been noted in children in other high risk populations. Understanding factors that promote successful adaptation in children would be a fruitful area for future research (Rutter, 1990) and would help clarify interventions that could be promoted to enhance children's successful adaptation.

Limitations of the Study

While using a large scale survey of this nature offers many advantages, and outweighs most limitations, there are still a number of limitations that must be addressed. First, the study is limited to data already collected by Statistics Canada. For instance, this survey only collected information on the frequency of children's witnessing physical aggression. Past research has identified that the intensity of the aggression witnessed is also an important parameter (Grych & Fincham, 1990, 1993; Jouriles, Farris et al., 1991) but no measure of this concept was available in the data. Likewise, the recency of witnessing aggressive acts was not assessed. Such information should be collected in future studies to obtain a more complete understanding of the effects of witnessing physical aggression on children's adjustment.

The study only examined maternal responsiveness. As the person most knowledgable about the child was the mother in 91.3% of the sample, the study was limited to maternal responsiveness. Although mothers are usually the primary caregivers, fathers do participate in parenting and influence children's adjustment.

Second, the study was limited to data that were released in the public use data file. As previously discussed, numerous variables were suppressed in order to protect the anonymity of respondents. Of particular importance is the respondent's ethnicity. Consequently, the ethnicity of the sample was not described and the influence of this variable excluded from all analyses. This omission, while unavoidable, was an important limitation of the study.

The sampling strategy employed by Statistics Canada excluded children living in institutions for over six months and children living on reserves. While this only represented 0.5% of Canadian children, it is quite possible that this strategy excluded many children who

have witnessed physical aggression in their families. It is possible that children who have difficulty coping with the effects of witnessing aggression have more mental health problems and thus are institutionalized for this very reason. Further, family violence is known to be more prevalent in aboriginal families than non-aboriginal families. The Ontario Native Women's Association of Canada (1989) estimated that 80% of aboriginal women are abused. Moreover, aboriginal women have two times more children than non-aboriginal women and children account for a larger percentage of the total population (Statistics Canada, 1992). Dumont-Smith (1995), a Canadian health researcher and aboriginal activist, asserts that more aboriginal than non-aboriginal children are witnessing violence in their families. In addition, children in foster care were also excluded from the current analyses since there was no information on the parenting. Yet, for obvious reason, children in foster care may be more likely to have witnessed aggression in their family. Thus, while the exclusion of these children may represent only 0.5% of the target population, it likely reduced the total number of children who have witnessed family aggression. These omissions are important.

Third, this study relied heavily on self-report data that is sensitive in nature. Mothers may have been biased in reporting or had difficulty recalling the amount of aggression their children witnessed or their own parenting and other behaviours (e.g., alcohol consumption). The tendency for individuals to respond in a socially desirable manner is well recognized and an important limitation of this study. At most, in all samples there was less than 10% of children who had witnessed aggression in their families. The skewed distribution is more likely to obscure relationships. Therefore, while the causal mechanisms observed in this study are valid, the structural coefficients quite likely are underestimated.

Fourth, this research was not able to assess for the possibility that parent-child aggression co-existed in families. Since current estimates suggest a significant overlap between different forms of aggression in families, the inability to determine the existence of parent-child aggression in this sample is an important limitation of this study since it can potentially confound the study results. Future investigations should identify and control for this variable in order to learn about the varying impact of these critical experiences on children's adjustment.

Finally, although the methodology of this study represents an improvement over most previous research in this area since structural equation modeling offers more potential for explanation, there is always the possibility that competing models will be consistent with the same data. For this reason, causation cannot be unquestionably established.

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APPENDICES

Appendix A

Studies Examining the Link Between Interparental Aggression and Children's Adjustment

Study: Bookless-Pratz & Mertin, 1990			
Sample	**Method**	**Analysis**	**Results**
N = 20 children Sample characteristics 11 boys, 9 girls 7 - 11 years old mean age = 8.8 years Shelter children 55% of children also abused Separated from violent male average of 4.8 weeks	Mother provided ratings: History of violence including degree of child involvement Child behaviour (CBCL) Child provided ratings: Self-concept (PIERS-HARRIS) Appraisal of violence	Descriptive statistics	50% of children exposed to violence for 6 or more years. 35% lived in a violence situation since birth. 55% of children had severe behaviour problems . Self-concept scores within normal for both boys and girls. No significant differences between boys and girls for internalizing, externalizing behaviours or social competence.

Study: Christopoulos, Cohn, Shaw, Joyce, Sullivan-Hanson, Kraft, & Emery, 1987			
Sample	**Method**	**Analysis**	**Results**
N = 80 children Sample characteristics 42 boys, 38 girls 5 - 13 years old mean age = 7.9 years 2 groups 40 children from shelters 40 comparison group matched on demographic characteristics	Interviews: with mothers and children. Mother provided ratings: Interparental conflict (OPS) Marital adjustment (MAT) Family functioning (FACES II) Depression (BECK) Child behaviour (CBCL) Child provided ratings: Perceived competence (PCS) Cognitive competence (WISC-R)	MANCOVA 2(group) x 2(sex) using income as a covariate. Analyzed separately by gender.	Shelter children had more internalizing problems than community children but not more externalizing problems. No significant difference for cognitive or social competence on the PCS. No significant difference in the vocabulary subtest of WISC-R. Children were dichotomized into a clinical group and a nonclinical group for both internalizing and externalizing behaviour scores. Significant differences were found for both internalizing and externalizing behaviour problems in girls but not boys. High correlations between maternal reports of conflict and the conflict that occurred in front of the child (r = .89 for physical aggression; r =.92 for verbal aggression)

Study: Copping, 1996			
Sample	**Method**	**Analysis**	**Results**
N = 75 children Sample characteristics 36 boys, 37 girls (gender data missing for 2 children) 3 - 15 years old Shelter children with no comparison group	Observations by shelter staff: of children for up to 11 weeks using rating scale of behaviours (physical, physiological, verbalized and feelings). These were further broken down into 10 sub-categories. Inter-rater reliability was 0.86.	Chi-square tests of the ratio of positive and negative behaviours in children.	Boys demonstrated more total behaviour problems than girls. Boys exhibited more verbal and feeling statements, nearly twice as many physical behaviours, and more physiological complaints (i.e., headaches) than girls. Majority of children were also abused. Children who experienced abuse in addition to witnessing abuse demonstrated more behaviour problems.

Study: Davis & Carlson, 1987			
Sample	**Method**	**Analysis**	**Results**
N = 66 children Sample characteristics 34 boys, 32 girls 4 - 11 years old 34 preschool children 19 boys, 15 girls 4 - 5 years old 32 school-age children 15 boys, 17 girls 6-11 years old Shelter children with no comparison group	Mother self-reported: History of interparental aggression. Mother provided rating: Child behaviour (CBC)	t-tests (multiple) Analyzed by gender and age.	Analysis by gender. Preschool boys had significantly more behaviour problems, were more aggressive, had more somatic and depressive symptoms and were less socially competent than preschool girls. School age girls had more behaviour problems, were more aggressive, had more somatic and depressive symptoms and were less socially competent than school age boys. Analysis by age. School-aged girls had more behaviour problems than preschool girls. In total, 68% of preschoolers and 53% of school-aged children were in the clinical range for depression. Children who witnessed abuse and were also abused had lower scores for social competence than children who only witnessed abuse. They had more internalizing and externalizing behaviour problems. Comments: All children witnessed abused. 50% of children were also abused.

Study: Emery & O'Leary, 1982			
Sample	**Method**	**Analysis**	**Results**
N = 50 children Sample characteristics 25 boys, 25 girls 8 - 17 years old boys' mean age = 11yrs, 4 mos girls' mean age = 12yrs, 4 mos Clinic sample of children from intact families	Mother provided rating: Marital adjustment (SMAT) Marital conflict (OPS) Child behaviour (BPC) Father provided rating: Marital conflict (OPS) Child behaviour (BPC) Child provided rating: Perceptions of marital discord (CPQ) Parental behaviour (PBI)	Correlational analysis	Parent's ratings of marital adjustment and discord significantly correlated only with conduct problems in boys; however, boys' perceptions of marital discord correlated with maternal ratings of conduct disorders (r = .-39), immaturity (r=-.41) and delinquency (r= -.35) using the BPC. Parent's ratings of marital adjustment and discord not significantly correlated with behaviour problems in girls. Girls' perceptions of marital discord also did not correlate with maternal ratings on BPC. Fathers' rating of marital discord were not correlated with behaviour problems in boys or girls.

Study: Emery & O'Leary, 1984			
Sample	**Method**	**Analysis**	**Results**
N = 132 children Sample characteristics 61 boys, 71 girls 2nd to 5th grade 19% in 2nd grade 26% in 3rd grade 28% in 4th grade 27% in 5th grade Mothers had average of 2 years college education Volunteer sample from elementary schools Children from two-parent families	Mother provided ratings: Marital satisfaction (SMAT) Marital conflict (OPS) Child behaviour (BPC) Teacher provided ratings: Child behaviour (BPC)	Correlational analysis	Weak but significant correlation between maternal ratings of marital discord (OPS) and total child psychopathology (r = -.24 for girls; and -.20 for boys) using the BPC. Maternal ratings of marital discord (measured by SMAT and OPS) were significantly correlated with teacher ratings on the BPC for total child psychopathology (r = -.17 for girls). Correlation was -.12 for boys but was not significant. Marital discord correlated significantly with teacher's rating of social competence for boys (r = -.28). Comments Authors concluded no gender differences (based on total child psychopathology) but results show there are gender differences when internalizing and externalizing behaviours are examined separately for boys and girls.

Study: Fantuzzo, DePaola, Lambert, Martino, Anderson, & Sutton, 1991			
Sample	**Method**	**Analysis**	**Results**
N = 107 children Sample characteristics 58 boys, 49 girls 3.5 - 6.4 years old mean age = 5.1 years 4 groups 23 shelter group exposed to verbal and physical conflict 27 home group exposed to verbal and physical conflict 30 home group exposed to verbal conflict 27 children home control group 84 shelter children 23 Head Start Program Families matched on SES and family composition variables Excluded abused children	Mother provided ratings: Interparental conflict (CTS) Child behaviour (CBCL) Child provided ratings: Perceived competence (PCSA)	ANOVA (three way) 1st factor 4 levels of group membership) 2nd factor gender 3rd factor with-in subject effect for scores on CBCL or PCSA scales Post-hoc analysis using Tukey	Verbal conflict assessed using the CTS only associated with moderate level of behaviour problems (CBCL). Verbal plus physical conflict associated with clinical levels of conduct problems and moderate levels of emotional problems and lower levels of social competence assessed by child reports on the PCSA. Verbal plus physical conflict plus shelter residence associated with clinical levels of conduct problems, higher level of emotional problems and lower levels of social functioning.

Study: Gleason, 1995			
Sample	**Method**	**Analysis**	**Results**
N = 47 children	Mother self-reported: History of violence	t-tests (multiple)	Children had significantly lower developmental skills than the normative data for the Vineland Adaptive Behaviour Scale.
Sample characteristics gender not specified 7 mos - 16 years old mean age = 4.9 years	Mother provided ratings: Child functioning (VAB S) Child behaviour (Connors-P)	Multiple t-tests with no correction of alpha.	Teachers rating of behaviour show that children had lower scores than the normative children on the Connors Teaching Rating Scale. There were no age or gender differences. 11% of the children had at least one domain in the functioning scale that was in the clinical range.
Children from 27 families in shelter	Shelter teacher provided ratings: Child behaviour (Connors-T)		71% of the children had parent ratings on the Connors in the clinical range, while 57% of the children had teacher ratings on the Connors in the clinical range.

Study: Hershorn & Rosenbaum, 1985			
Sample	**Method**	**Analysis**	**Results**
N = 45 boys Sample characteristics mean age = 9.1 years 3 groups 15 children in the physical marital violence group 12 from nonviolent, but maritally discordant group 18 from satisfactorially married group Children of mothers referred for marital therapy	Mother provided ratings: Marital satisfaction (SMAT) Overt marital hostility (OPS) Child behaviour (BPC) Child rearing style (PPBFI)	ANOVA Post hoc comparison using Tukey HSD	Children exposed to marital discord and violence (OPS) were more likely to exhibit conduct and personality problems (measured by BPC) than children in the satisfactorily married control group. Abused women did not differ significantly from the two comparison groups in their use of harsh parenting practices (PPBFI). A punitive parenting style was significantly related only to conduct problems while exposure to violence was related to both conduct and personality problems.

Study: Holten & Ritchie, 1991			
Sample	**Method**	**Analysis**	**Results**
N = 74 children Sample Characteristics 35 boys , 39 girls 2 - 8 years old 2 groups 20 boys, 20 girls 2 - 4.9 years old mean age = 3.2 years 15 boys, 19 girls 5 - 8 years old mean age = 6.5 years Shelter children and a comparison group matched for age and sex	Mother provided ratings: Interparental aggression (CTS) Parenting stress (PSI) Child behaviour (CBCL) Child temperament (PTF) Family Situations (CPSS) Observations: Mother-child interactions Inter-rater reliability = .87	MANOVA (2 [family type] X 2 [sex] X 2 [child's age]) Post hoc tests Student-Newman Keuls used to identify groups differences Log-linear analyses for categorical data	Children exposed to parental violence had significantly more overall behaviour problems (27% in the clinical range) and internalizing problems than comparison children. Children did not differ in terms of externalizing behaviours. Children were more likely to become involved in conflicts according to the observational data. Battered women viewed their spouses as more short-tempered, irritable, and uninvolved in parenting than comparison women appraised their husbands. Battered women had higher scores on the parenting stress index than comparison mothers but found no differences in child-rearing practices. Maternal stress and paternal irritability were significant predictors of behaviour problems.

Study: Hughes, 1988			
Sample	**Method**	**Analysis**	**Results**
N = 178 children Sample characteristics 86 boys, 84 girls 3 - 12 years old 3 groups 40 witnesses 55 abused-witnesses 83 comparison children from similar economic background Shelter children with comparison group Comparison mothers had more education and higher income	Mother provided ratings: Interparental violence (CTS) Child behaviour (ECBI) Anxiety (RCMAS) Child provided ratings: Depression (CDI for 7 - 12 year old children) Self-esteem (McDaniel-Piers for 6 - 8 year old children and Piers-Harris for 9 - 12 year old children)	MANOVA then ANOVA and planned comparisons using Fisher's least-significant difference (LSD) method. Analyses conducted by abuse status and age (4-5, 6-8, 9-12 year olds).	Analysis by abuse status Abused-witnesses had significantly higher problem and intensity behaviour scores (ECBI) than both other groups. Nonabused witnesses not significantly different from comparison children. Both witnesses and abused-witnesses had higher mean scores for child-reported anxiety (RCMAS) than the control group. No differences found for depression using the CDI. Except for depression, abused witness were consistently different from the control group regardless of the source (mother or child). Nonabused/witness show levels of distress between the other groups regardless of report used (mother or child). Analysis by age In 6- 8 year olds, control children scored higher than the other two groups on self-esteem. Witness and abused-witnesses did not differ. For the 9 - 12 year olds, control children scored higher than abused-witness children on self-esteem but not significantly higher than the nonabused-witness children. Preschool children scored significantly higher for behaviour (problem and intensity) scores but lower for anxiety than both middle and older children. A significant age by abuse status interaction was obtained for the total behaviour scores. For the youngest group, the abused-witness children's scores were nearly 20 points higher than the children in the other two groups and significantly different from every other group. However, small numbers in this analysis.

Study: Hughes & Barad, 1983			
Sample	**Method**	**Analysis**	**Results**
N = 65 children Sample characteristics 35 boys, 30 girls 2.9 - 12.6 years old 27 preschool age 16 boys, 11 girls 2.9 - 6.7 years old 19 young school-age 9 boys, 10 girls 6.3 - 10.3 years old 19 older school-age 10 boys, 9 girls 9 - 12.7 years old Shelter children with no comparison group	Mother provided ratings: Child behaviour (BPC) modified BPC for preschool children Staff or teacher provided ratings: Child behaviour (BPC) modified BPC for preschool children Child provided ratings: Manifest anxiety (adapted from CMAS) Self-esteem MPSCS for preschool children McDaniel-Piers for Young school-age Piers-Harris for older school-age children	ANOVA t-tests	Girls scored higher for internalizing symptoms (anxiety) than boys. Girls scored higher for worry/oversensitivity than boys. According to maternal report, school-age boys were more aggressive than girls. Preschool children reported level of self-esteem that were 1.5 standard deviations below norms. Younger school-age children scored 1 standard deviation lower than norms. No difference in externalizing behaviour problems between shelter children and standardized norms when rated by staff. Significant difference found between mother's and staff's ratings of children behaviour. Pervasive tendency for mothers to view children's behaviour more negatively than did other observers. Preschoolers had most difficulty adjusting to family disruption. Gender differences only for school-age children.

Study: Hughes, Parkinson, & Vargo, 1989			
Sample	**Method**	**Analysis**	**Results**
N = 150 children Sample characteristics 4 - 12 years old 3 groups 40 abused witnesses 44 nonabused witnesses 66 comparison children from similar economic background 84 children from 37 shelter families 66 children from 45 community families Shelter mothers were less educated than other mothers.	Mother completed ratings: Interparental aggression (CTS) Child behaviour (CBCL) Child provided ratings: Anxiety (RCMAS) Depression (CDI) measured in children over 8 years old.	MANOVA then ANOVA and planned comparisons using Fisher's least-significant difference (LSD) method. Analyses conducted by gender and three age groups (4-5, 6-8, 9-12). Analysis also conducted by gender and three age groups (4-5, 6-8, 9-12).	In both internalizing and externalizing, the abused-witnesses had higher mean scores for behaviour problems (CBCL) than the comparison group. Witness children received scored between the other groups but were not significantly different from the other groups. School-aged children had the most behaviour problems. Within each age group, abuse-witness children had the most difficulties. Preschool children were not rated as less well-adjusted than other groups. Younger and older children received higher problem behaviour scores.

Study: Jaffe, Wolfe, Wilson, & Zak, 1985			
Sample	**Method**	**Analysis**	**Results**
N = 100 children Sample characteristics 56 boys, 44 girls 4 - 12 years old 2 groups 50 shelter children 29 boys, 21 girls mean age = 8.4 yrs 50 comparison children 27 boys, 23 girls mean age = 8.8 yrs Shelter children with comparison group	Structured interviews: with mothers. Mother provided ratings: Interparental aggression (CTS) Maternal health (GHQ) Child adjustment (CBC). Family disadvantage Stress (LES)	Not specifically stated ANOVA assumed.	Boys from violent families had significantly more behaviour problems and more difficulties in social competence (CBC) Girls did not differ significantly on these variables. Shelter mothers had significantly more somatic problems, anxiety, insomnia, and depression than comparison mothers.

Study: Jaffe, Wolfe, Wilson, & Zak, 1986a			
Sample	**Method**	**Analysis**	**Results**
N = 126 children <u>Sample characteristics</u> 69 boys, 57 girls 6 - 11 years old <u>3 groups</u> 58 shelter children 36 boys, 22 girls mean age = 8.9 yrs 68 comparison children 33 boys, 35 girls mean age = 8.4 yrs Shelter children with comparison group	<u>Mother provided ratings:</u> Interparental aggression (CTS) Child behaviour (CBCL)	Pearson's correlations t-tests (multiple)	Amount of interparental aggression (CTS) significantly correlated with children's overall adjustment (CBCL) for the total sample ($r = .31$, $p < .001$). However, relationship was significant for boys ($r = .47$, $p < .001$; but not for girls ($r = .13$). Shelter girls were reported to display significantly more internalizing behaviours and less social competence than comparison girls. No difference in externalizing behaviour problems. Boys differed from the comparison group on internalizing and externalizing behaviours, and social competence. <u>Comments:</u> Although authors used multiple t-tests, all tests reported were significant at .01 except for girls internalizing behaviour and social competence which was significant at the .025 level.

Study: Jaffe, Wolfe, Wilson, & Zak, 1986b			
Sample	**Method**	**Analysis**	**Results**
N = 65 boys Sample characteristics 4 -16 years old mean age = 8.9 years 3 groups 32 boys from shelters 18 abused boys from welfare agency 15 comparison boys Groups comparable on demographic variables	Mother provided ratings: Interparental aggression (CTS) Interparental hostility (OPS) Child behaviour (CBC)	ANOVA with pairwise contrasts	Both the abused and the witness boys differed significantly on measures of internalizing and externalizing problems (CBC). There was no significant differences in social competence. Abused boys demonstrated significantly more externalizing symptoms than boys exposed to family violence.

Study: Johnston, Gonzàlez, & Campbell, 1987			
Sample	**Method**	**Analysis**	**Results**
N = 56 children Sample characteristics 28 boys, 28 girls 4 - 12 years old ethnically diverse diversity in SES (M = 4, SD = 1.96) on the Hollingshead Recruited from families referred for ongoing mediation (in custody disputes postdivorce) No comparison group of children from nondisputing families.	Parents provided ratings: Interparental conflict (CTS), verbal and physical subscales combined for analysis / severe forms of physical violence weighted heavier. Child behaviour (CBCL) Self-concept (Piers-Harris) Observations: (1) parent-child interactions. 2 counsellors rated the degree of child involvement in the parental dispute and the degree of role reversal with inter-rater reliability. (2) children's play sessions.	Repeated measures Descriptive statistics Hierarchical regression analysis Analyzed for age and sex effects. ANOVA (age group) (4-5; 6-8 and 9-12 years) by sex. Baseline (at the time of legal dispute) and measured 2 years later.	21% of children found to be in clinical range for total behaviour problems indicating that children were 2 to 4 times more likely to be clinically disturbed compared to nonreferred population. At baseline, interparental verbal and physical aggression did not predict parental ratings of total child conduct problems, (depression, withdrawal, somatic complaints and aggression); it became a consistent significant predictor of total behaviour problems 2 years later (depression, withdrawal, aggression, but not somatic problems). Moreover, controlling for baseline level of parental conflict, parental verbal and physical aggression at 2 years predicted additional variance at follow-up. Child involvement in disputes and role reversal with father were significant predictors of total child behaviour problems at baseline. Found no significant main effects of age or sex except girls were more likely to have somatic complaints at follow-up. ANOVA (sex and age groups) confirmed regression analysis - no effects for age or sex or for an interaction between age and sex Repeated regression using age by parental aggression and sex by parental aggression. No significant interactions at baseline. At 2 years, girls in high-conflict families were more withdrawn and depressed and older children in high-conflict were more inclined to have somatic complaints and to be aggressive.

Study: Johnson & O'Leary, 1987			
Sample	**Method**	**Analysis**	**Results**
N = 42 girls Sample characteristics 9 - 11 years old 25 children with conduct problems 17 children without conduct problems All from intact homes both groups of parents were similar on income, education and number of children in family Nonclinic sample	Parents provided ratings: Marital adjustment (SMAT) Marital conflict (OPS) Aggression subscale (Personality research form) Parental behaviour (PPBFI) Child behaviour (RBPC) Social competence subscale (CBC) Child interviewed: to assess perceptions of family life and relationship with parents. Child provided ratings: Perceptions of parent's marriage (CPQ) Aggressive behaviour (RBPC)	Pearson's correlations t-tests	Mothers of conduct disordered girls were significantly more hostile towards spouses (OPS) than mothers of non-conduct disordered girls. Mothers of conduct disordered girls did not differ from the control group in marital satisfaction but did differ in their reports of overt conflict. Mothers' behaviour patterns more closely associated with children's than fathers. Mothers' self-report of OPS were significantly correlated with conduct disorders (r = .30) but not with social competence. These were both nonsignificant for fathers. Fathers of conduct disordered girls adopted a more aggressive behavioural style than fathers of nonconduct disordered girls. Children's perceptions of conduct disorders correlated significantly with fathers (r = .35) but not mothers.

Study: Jouriles, Barling, & O'Leary, 1989			
Sample	**Method**	**Analysis**	**Results**
N = 45 children Sample characteristics 22 boys, 23 girls 5 - 13 years old mean (boys) = 8.7 yrs mean (girls) = 8.2 yrs Clinic referred children	Mother self-reported: History of child witnessing interparental aggression. Mother provided ratings: Interparental aggression Modified (CTS) to assess frequency of children witnessing aggression Parent-child aggression for both parents (CTS) Child behaviour (RBPC) Child depression (CDI)	Correlational analysis Hierarchical regression analysis	No gender differences in child behaviour problem scores. Maternal ratings on a modified version of the CTS used to assess the frequency that children observed marital aggression. Witnessing interspousal aggression was strongly and significantly correlated with parental aggression toward the child ($r = .56$, $p < .001$) High levels of parent-child aggression were associated with conduct problems, attention problems, anxiety-withdrawal, and motor excess. Frequency of witnessing was not correlated with maternal ratings of child behaviour (RBPC). In the regression analyses, parent-child aggression predicted all outcomes variables (conduct problems, attention problems, anxiety-withdrawal and motor excess) after the effects of age and interspousal aggression were controlled.

Study: Jouriles, Murphy, Farris, Smith, Richters, & Waters, 1991			
Sample	**Method**	**Analysis**	**Results**
Study 1 N = 200 boys Sample characteristics 36-42 months old mean age = 38.8 mos Community sample of lower to middle class with intact marriages Study 2 N = 87 boys Sample characteristics 4 - 6 years old Community sample	Study 1 Mother provided rating: General marital disagreements adapted from (SMAT) Child-rearing disagreements (CRD) Children's exposure/reactions to marital disagreements Child behaviour (CBCL) Study 2 Mother provided rating: Interparental conflict (OPS) General marital adjustment adapted from (SMAT) Child-rearing disagreements (CRD) Child behaviour (CBCL)	Hierarchical regression analysis	Study 1 Child-rearing disagreements predicted a greater variety of behaviour problems identified by the authors as being problems for nonclinic referred children such as lying, disobeying, abusing property, hurting others) than general, non child related disagreements. Study 2 Maternal reports of child-rearing disagreements significantly correlated with internalizing behaviour problems ($r = .39$) after marital conflict (OPS) was controlled. However, child-rearing disagreements were not associated with externalizing behaviour problems after marital conflict (OPS) was statistically controlled. Marital conflict failed to correlate significantly with internalizing or externalizing behaviour problems after controlling for child-rearing disagreements.

Study: Jouriles, Murphy, & O'Leary, 1989			
Sample	**Method**	**Analysis**	**Results**
N = 87 children Sample characteristics 41 boys, 46 girls 5 - 12 years old mean (boys) = 8.2 yrs mean (girls) = 8.9 yrs Children of parents in marital therapy	Parents provided ratings: Interparental aggression (CTS) Marital adjustment (SMAT) Child behaviour (BPC)	Hierarchical regression analysis	Parental ratings of physical aggression predicted parents' reports of child conduct problems, personality problems, inadequacy /immaturity and clinical levels of problematic child behaviour on the BPC after marital discord, child's age, child's sex and the interaction of child sex by marital discord was statistically controlled. 50% of children from maritally aggressive homes not exhibiting problems at clinical levels.

Study: Jouriles, Norwood, McDonald, Vincent, & Mahoney, 1996			
Sample	**Method**	**Analysis**	**Results**
Study 1 N = 55 children Sample characteristics 23 boys, 32 girls 5 - 12 years old mean (boys) = 8.3 yrs mean (girls) = 9.7 yrs Families referred for marital therapy with no comparison group Study 2 N = 199 children Sample Characteristics 106 boys, 93 girls mean (boys) = 8.6 yrs mean (girls) = 8.8 yrs Shelter children with no comparison group	Parents provided ratings: Interparental aggression (CTS) Child behaviour (BPC) conduct and personality disorder subscales	Hierarchical regression analysis	Study 1 In the clinic referred group, both physical marital aggression and other forms of marital aggression related positively with children's externalizing behaviours assessed using the BPC. Study 2 In the shelter group, both physical marital aggression and other forms of marital aggression correlated positively with both internalizing and externalizing behaviours (BPC).

Study: Jouriles, Pfiffner, & O'Leary, 1988			
Sample	**Method**	**Analysis**	**Results**
N = 60 children Sample characteristics 30 boys, 30 girls 18 to 31 months old Nonclinic sample	Mother provided ratings: Marital satisfaction (SMAT) Interparental aggression (OPS) Child Behaviour - 9 item scale modified from Sullivan & O'Leary Observations of: Parent-child interaction Behaviours scored by 2 observers with 90% agreement.	Correlational analysis Pearson's correlations	Maternal report on a modified version of the OPS was correlated with maternal reports of child behaviour problems for boys and girls. Mothers less likely to punish deviant behaviour in girls.

Study: Kolbo, 1996			
Sample	**Method**	**Analysis**	**Results**
N = 60 children Sample characteristics 30 boys, 30 girls 8 - 11 years old Children referred for treatment or support groups for families experiencing violence No comparison group All but two children had also been abused (97%).	Parents provided ratings: Interparental aggression (CTS) Child behaviour (CBCL) Child provided ratings: Global Self-Worth Scale (SPPC) Supportive relationships (SRQ) Child verbally administered: Block and vocabulary subscales to assess IQ (WISC-R).	Correlational analysis Hierarchical regression analysis to determine whether gender, IQ, or support mediated the relationship between exposure and behaviour problems and self-worth.	No differences between boys and girls in terms of support, SES, behavioural problems or self-worth. Girls IQ was significantly lower than boys. Exposure to interparental aggression was positively correlated with parental reports of behavioural problems (r = .26), and negatively correlated with self-worth (r = -.28). Support was negatively correlated with behaviour problems (r = -.32) and positively correlated with self-worth (r = 35). IQ was negatively correlated with behaviour problems (r = -.28) and positively correlated with self-worth (r = .25). Regression showed that gender mediated the relationship (gender by exposure), interaction was significant. Correlation repeated by gender. Exposure was positively correlated with behavioural problems among girls (r = .52), but there was no significant correlation for boys. Exposure was negatively correlated with self-worth among boys. High levels of support protected boys only from the effects of exposure.

Study: Markward, 1997			
Sample	**Method**	**Analysis**	**Results**
N = 100 women with children Women random selected from 515 women who had used shelters during a 22 month period	Mother interviewed: re: child behaviour including school-related difficulties sleeping problems abuse status medical problems	Chi-square tests Descriptive statistics	72% of women reported that children were involved in the violent situation. Children who were also abused had more negative behaviour. They were more aggressive, more defiant, more withdrawn, and had more difficulties at school. Children who were also abused behaved more negatively then children who only witnesses violence against their mothers. Chi-square test showed that the frequency with which women reported that the child was abused was associated with more aggression and oppositional behaviour, more school-related difficulties, difficulties going to bed and being withdrawn.

Study: Mathias, Mertin, & Murray, 1995			
Sample	**Method**	**Analysis**	**Results**
Phase I N = 79 children Sample characteristics 47 boys, 32 girls 6 - 12 years old mean age = 10 years Children were past residents of shelters (mothers separated an average of 19 months) Phase II N = 44 children Sample characteristics 22 children from Phase I 22 control children not exposed to domestic violence. Matched on sex, age, SES and reading age.	Mother provided ratings: Interparental aggression modified (CTS) Child behaviour (CBCL) Social skills (VABS) General health (GHC) Child provided ratings: Anxiety (RCMAS) Social problem solving (CATS) Reading ability (Neale)	Phase I Descriptive ANOVA Logistic Regression Phase II univariate analyses (multiple t-tests) Chi-Square and Fisher Exact Probabilities Tests Logistic Regression	Phase I: 37 - 47% of children in clinical range for behaviour problems (CBCL), 52% had below-average levels adaptive behaviour skills. Only 51 to 57% of children were reading at a level appropriate to their age. However, the majority of children showed normal levels of anxiety (RCMAS) and few children (6-15%) experienced high levels of anxiety once removed from the situation. Compared to a normative sample, the present sample demonstrated significantly fewer aggressive and more assertive responses to hypothetical conflict situations (CATS). Boys chose significantly fewer submissive responses and more aggressive responses than girls. Children's victimization was related to internalizing behaviours as well as the total behaviour problem score. Children were 2.8 times more likely to have clinical range internalizing problems if they had been involved in abuse than if they had only witnessed and 4.25 times more likely to fall within the borderline-clinical range for total problem behaviour scores. Phase II: Significant differences were found for both internalizing and externalizing behaviour problems (CBCL), the communication, socialization subscales and the total adaptive behaviour composite score (VABS). No significant differences were found in level of anxiety or on social problem-solving skills. Internalizing problem behaviours was a significant predictor of group membership (children exposed /not exposed to domestic violence).

Study: McCloskey, Figueredo, & Koss, 1995			
Sample	**Method**	**Analysis**	**Results**
N = 365 children Sample characteristics 183 boys, 182 girls 6 - 12 years old mean age = 9.2 years 4 groups 64 shelter children 102 children from community exposed 199 comparison children from community with no history of exposure Comparison sample had higher income	Mother and child interviewed: Interviewed separately in English or Spanish by different interviewers blind to study group. Instruments translated into Spanish and administered orally to all. Mother provided ratings: Interparental aggression (CTS) Parent-child aggression (CTS) Mental Health (BSI) Child behaviour (CBC) Child psychiatric problems (CAS) Parental warmth (Parent Perception Inventory Parental behaviour (PAQ) Child-sibling support (GB) Child provided ratings: Parental warmth (Parent Perception Inventory) Parent-child aggression Sexual molestation	Structural equation modeling Canonical correlations to examine whether different forms of abuse were related to different manifestations child psychopathology. ANOVA	Models using both mother's or child's reports did not perfectly predict all the covariances between the items but fit indices > .90. Both models showed direct effects of family violence (FV) on children's mental health. Lower-order factor models showed that experiencing aggression as a child added more weight to the FV factor than witnessing aggression. General patterns of results similar, there were some differences between models using mother's and child's reports. Although mothers showed symptoms of psychopathology, it was causally unrelated to child psychopathology (i.e., mothers mental health did not mediate the effects of violence on children). FV accounted for most of the variance in children's mental health. Children perceived their mothers as less warm, but family support (includes maternal warmth) failed to predict child's psychopathology. FV accounts for 12% of the variance in child's reports and 56% of the variance in mother's reports. Different forms of aggression highly correlated. Almost 10% of children were sexually molested. Sexual abuse related to more internalizing than externalizing behaviours. Less spousal aggression in families with only one child. Significantly more children from violent homes were conduct-disordered, had separation-anxiety, attention-deficits, and obsessive-compulsive disorders. Divergence in maternal and child reports of symptoms. Convergence of maternal and child reports of family violence.

Study: O'Keefe, 1994

Sample	Method	Analysis	Results
N = 185 children Sample characteristics 94 boys, 91 girls 7 - 13 years old mean age = 9.5 years Children from 120 families in shelter Sample was ethnically diverse	Interviews: Mother and child separately. Mother provided ratings: Interparental aggression (CTS) Marital satisfaction (MAT) Family cohesion (FACES III) Stress (LES) Alcohol/drug abuse Family size Formal/informal support Child behaviour (CBCL) Child temperament (EAS) Parent-child aggression (CTS) Self-report of quality of parent-child relationship (one item which correlated .84 with Hudson scale) Child provided ratings: Self-Worth (subscale of the Perceived Competence Scale) Social competence (CBCL) School Scale (CBCL)	Correlational analysis. Stepwise multiple regression.	45% of children had externalizing behaviours in the clinical range. 57% of children had internalizing behaviours in the clinical range. Temperament, amount of violence witnessed, amount of mother-child violence, quality of father-child relationship and the total number of formal and informal supports were all significantly correlated with both internalizing and externalizing problems. Externalizing problems were predicted by the quality of the mother-child relationship, positive child temperament, school performance, self-worth, child's age (young children more affected) and the amount of violence witnessed explaining 42% of the variance. Amount of violence witnessed remained after the effects of the other variables were partialed out. Internalizing problems were predicted by the positive child temperament, stressful life events, sociability, and the amount of mother-child abuse, explaining almost 35% of the variance. No gender differences found.

Study: Porter & O'Leary, 1980			
Sample	**Method**	**Analysis**	**Results**
N = 64 children Sample characteristics 37 boys, 27 girls 5 - 16 years old mean age = 10.5 years Clinic referred children of two-parent families	Mother provided ratings: Marital adjustment (SMAT) Overt marital hostility (OPS) Child behaviour (BPC)	Correlational analyses Analyzed by sex and age groups (5 - 10 years 11 - 16 years). McNemar test of the significance of the difference between correlations. t-tests for gender differences.	Overt marital hostility significantly associated with boys' behaviour problems but not girls. In 5 - 10 year old boys, significant correlations found between overt marital hostility (OPS) and total behaviour scores (r = .45) and conduct disorder subscale (r = .40); but not with marital adjustment (SMAT). In older boys, significant correlations found between overt marital hostility and total behaviour scores (r = .63) and several subscales [personality disorder (r = .45), inadequacy-immaturity (r = .63) and socialized delinquency subscales (r = .42)]; but not with marital adjustment. In girls, there were no significant correlations with either overt marital hostility or marital adjustment. Indication of a greater relationship between overt marital hostility and children's behaviour problems than between marital adjustment and children's behaviour problems. No significant difference between boys and girls mean scores on subscales of the BPC. There was a significant difference between mothers of girls and mothers of boys for marital adjustment (SMAT scores). Mothers of boys had higher scores (i.e., girls came from homes that were clearly discordant).

Study: Rosenbaum & O'Leary, 1981			
Sample	**Method**	**Analysis**	**Results**
N = 53 boys Sample characteristics mean age = 10 years 3 groups one group of children exposed to marital violence two comparison groups (1) group randomly selected from satisfactorily married women (2) second group from nonviolent but discordant marriages. No significant difference between groups in mothers's age, years married, number of children, or income.	Mother self-reported: History of marital violence Mother provided rating: Child behaviour (BPC)	ANOVA	No significant differences for conduct disorders, personality disorders, inadequacy-immaturity or delinquency assessed using the BPC. Abusive husbands were significantly more likely to come from families characterized by marital violence than husbands in either of the two control groups.

Study: Rossman & Rosenberg, 1992			
Sample	**Method**	**Analysis**	**Results**
N = 94 children Sample characteristics 41 boys, 53 girls 6 - 12 years old 4 groups 25 shelter children 18 children from intact/ violent homes 22 from discordant/ nonviolent homes 29 from nondiscordant/ nonviolent homes	Mother provided ratings: Interparental aggression (CTS) Marital adjustment (DAS) Child behavior (CBCL) Stress in children's lives (LES-C) Child provided ratings: Vocabulary subtest (WISC-R) Competence in six domains -- academic, social, athletic, physical appearance, behavioural conduct and general self-worth) (Self-Perception Profile) Beliefs about control during parent's marital conflict (Discord Control and Coping Questionnaire)	ANCOVA with SES as a covariate. Post-hoc tests using Newman-Keuls. Hierarchical regression analysis	Children from maritally violent shelter families were reported by mothers to be higher on the CBCL externalizing problems, the social activity scale, the social competence scale than children in the other groups. There was a trend for aggression to be higher in children living in violent homes but it only approached significance ($p = .058$). Children reported feeling less competent than children in other groups. Regression analysis revealed that higher levels of conflict control beliefs acted as compensatory moderators of stress, being associated with lower levels of problem behaviours across stress levels. However, higher levels of conflict control beliefs acted as vulnerability moderators with regards to children's perceptions of competence.

Study: Smith, Berthelsen, & O'Connor, 1997			
Sample	**Method**	**Analysis**	**Results**
N = 54 children Sample characteristics 29 boys, 25 girls 3 - 6 years old mean age = 64 months Mothers were former shelter residents, now living independently for at least 3 months (ranged from 3 months to 2 years)	Structured interviews with mothers. Mother provided rating: Interparental aggression (CTS) Child behaviour (CBCL)	Thematic analysis for qualitative data. ANOVA and post-hoc Scheffe test.	26% of boys and 24% of girls had scores in the clinical range for internalizing behaviours while 41% of boys and 28% of girls had scores in the clinical range for externalizing behaviours (CBCL). Overall, 42% had total behaviour problem scores in the clinical range. Children divided into groups based on maternal reports of the amount of exposure to violence and the degree of child management problems prior to separation. Children who were unmanageable prior to the separation or were exposed to a greater percentage of the violence had more internalizing and externalizing problems post-separation. Children who withdrew during the conflict had more internalizing problems than children who responded in other ways (i.e., intervened). Mothers who reported less quality in the parent-child relationship (using self-report) also reported more internalizing and externalizing behaviour problems. Comments: 33% of the mothers were physically assaulted after they were separated from partners.

Study: Spaccarelli, Sandler, & Roosa, 1994			
Sample	**Method**	**Analysis**	**Results**
N = 303 children Sample characteristics 10-12 year s old mean age = 10.5 years 4th - 6th grade Community sample recruited from inner-city schools	Mother self-reported: History of violence Mother provided rating: Child behaviour (CBCL) Parental drinking problem (DIS and SMAST) Child provided rating: Global self-worth (SPPC) Depression (CDI) Youth Hostility Scale (CBCL)	Correlational analysis Hierarchical regression analysis	Wife abuse significantly correlated with self-reported depression in boys and girls, and with conduct problems and self-esteem in girls. Zero-order correlations between history of violence were not significant for depression, anxiety, or conduct problems in either gender when maternal reports were used. Girls: Regression showed that family size and maternal alcohol problems predicted self-reported conduct problems accounting for a total of 8% of the variance while spousal violence accounted for an additional 3% unique variance. Maternal alcohol problems and divorce predicted self-reported depression accounting for a total of 9% of the variance while spousal violence failed to account for any additional variance. There were no significant predictors for self-esteem. Boys: After controlling for demographic and historical risk variables, spousal violence did not account for significant variance in all three adjustment variables. Maternal education was the only variable to predict self-reported depression and conduct disorders. Frequent family moves and fathers' incarceration predicted self-esteem. Wife abuse more strongly associated with child's self report of adjustment problems than with maternal reports.

Study: Sternberg, Lamb, Greenbaum, Cicchetti, Dawud, Cortes, Krispin, & Lorey, 1993			
Sample	**Method**	**Analysis**	**Results**
N = 110 children Sample characteristics 61 boys, 49 girls 8 - 12 years mean age = 10 .5 yrs 4 groups 33 abused 18 boys, 15 girls 16 witness 8 boys, 8 girls 30 abused witness 21 boys, 9 girls 31 comparison 14 boys, 17 girls Community sample of lower-class, two-parent Israeli families. No differences among groups on several background variables (SES, unemployment, birth order, health problems).	Mother, father and child interviewed: interviewed separately. Data collected from all mothers, children and 75 to 85% of fathers depending on the group. Questionnaires translated from English to Hebrew and back translated to English to ensure accuracy. Parent provided ratings: Child behaviour (CBCL) Child provided ratings: Depression (CDI) Child behaviour (YSR)	MANOVA two way (group by sex) then univariate tests. Analyzed separately based on who provided the reports (mothers, children, and fathers). Analyzed 2 ways. (1) all 3 domestic violence groups were collapsed into one group and compared to the control group. (2) 4 groups analyzed separately.	Children's reports: Domestic violence (DV) group significantly different from control group on internalizing and externalizing behaviours (CBCL) and depression (CDI). No gender differences. Significant differences also seen when 4 groups examined separately. The DV groups had significantly more depression, more internalizing and externalizing behaviours than the control group. Significant interaction found. Girls in the child and spouse abuse groups reported more externalizing behaviours than boys. Girls in the abused-witnesses and comparison groups reported fewer externalizing behaviours. Parent's reports: For mothers, there were significant main effects: children in the DV group had more externalizing (not internalizing) behaviours than controls. Significant group by sex interaction; girls in the DV group had more internalizing and externalizing behaviours than boys. Girls in the comparison goup had fewer problems than boys. There was significant differences between 4 groups for mother's reports (not fathers). Mothers of children in the spouse and abused-witnesses groups reported more externalizng problems than mothers of comparison children. Significant effect for gender: mothers reported that girls had more internalizng and externalizing behaviours than boys. Group by sex interaction: mothers of girls in all 3 DV groups reported more externalizing behaviours than mothers of boys. Mothers of control girls reported fewer problems than mothers of boys. There was low agreement among different informants.

Study: Westra & Martin, 1981			
Sample	**Method**	**Analysis**	**Results**
N = 20 children Sample characteristics 10 boys, 10 girls 2 ½ - 8 years old mean age = 5yrs 2mos Shelter children with no comparison group.	Mother provided rating: Parental nurturance (WPAQ) Child provided rating: Motor and cognitive development (MSCA) Pediatrician: Medical exam Child-care staff provided rating: Child behaviour (PBQ)	Correlational analysis	Shelter children demonstrated more aggressive behaviour than standardized norms. Children also had more physical problems including hearing and articulation, lower verbal ability and motor abilities. Children were significantly lower than standardized norms on measures of verbal, motor, and cognitive abilities using the McCarthy Scale of Children's Abilities. Children used a variety of strategies to protect their mothers. Boys demonstrated more aggression than girls.

Study: Wildin, Williamson, & Wilson, 1991			
Sample	**Method**	**Analysis**	**Results**
N = 76 children Sample characteristics 39 boys, 37 girls 9 mos - 13 years old mean age = 6.7 yrs Shelter children with no comparison group.	Mother provided rating: History of violence Medical history Child development (MCDI) Child behaviour (LBC) School history	Descriptive statistics Chi-square tests	75% of children were also abused. 39% showed developmental delays according to test criteria. 46% had one or more indicators of academic problems as measured by failing grades, repeating grades and/or receiving special services in school. Children in families with child physical and/or sexual abuse did not have more academic problems than those in families reporting verbal abuse and/or neglect only or than those not reporting abuse. Over 87% of children had behaviour problems. Scales pertaining to aggression, antisocial behaviour and social inhibition were most commonly elevated. In six children who ranged in age from 7 ½ years to 12 ½ years, there were suicidal attempts or ideation.

Study: Wolfe, Jaffe, Wilson, & Zak, 1985			
Sample	**Method**	**Analysis**	**Results**
N = 198 children Sample characteristics 98 boys, 100 girls 4 - 16 years old 2 groups 102 children from shelters 96 children from nonviolent homes Shelter children with comparison group recruited from community	Mother provided rating: Interparental aggression (CTS) Parent-child aggression (CTS) Maternal health (GHQ) Negative life events (Life Experiences Survey) Family crises Child behaviour (CBCL)	MANOVA for maternal and child variables Canonical correlations Hierarchical Regression Analysis	Significantly more children from violent homes fell into the high range on the CBCL. When examined by gender, association strong for boys but not girls. Children exposed to marital violence differed from comparison group of children on all three outcomes (internalizing, externalizing and levels of social competence). 27 children from violent home had scores in the normal range. Regression revealed that maternal stress and family violence variables combined accounted for 19% of the variance in child behaviour problems and accounted for 16% of the variance in social competence. Found significant differences between groups in changes in residence since birth of first child, number of children in family, marital separations, and family's contact with mental health services.

Study: Wolfe, Zak, Wilson, & Jaffe, 1986			
Sample	**Method**	**Analysis**	**Results**
N = 63 children Sample characteristics 15 boys, 8 girls 4 - 13 years old 3 groups 17 children from shelters 23 children were last exposed at least 6 months prior (i.e., former residents) 23 children from nonviolent homes Comparison children recruited from community	Mother provided rating: Interparental aggression (CTS) Family disadvantage Maternal health (GHQ) Stress Related to Life Events (LES) Child behaviour (CBCL)	MANCOVA for maternal and child variables ANCOVA Both the number of children in family and number of separations in previous two years were used as covariates. Planned contrasts	Children recently exposed to marital violence (i.e. shelter residents) exhibited lower levels of social competence than former residents or children from nonviolent homes, according to CBCL ratings. Children recently exposed were reported as having fewer interests, fewer social activities, and lower school performance but not significantly more behaviour problems. Although trends were evident for higher internalizing and externalizing scores in children recently exposed to marital violence, the difference was not significant. No group differences on ratings of emotional problems. No group differences for internalizing or externalizing behaviour problems. Both shelter groups had significantly more separations in the two previous years. Former residents had significantly more children than other groups.

Abbreviations Used

BECK	Beck Depression Inventory
BPC	Behaviour Problem Checklist
BSI	Brief Symptom Inventory
CAS	Child Assessment Schedule
CATS	Children's Action Tendency Scale
CBC / CBCL	Child Behaviour Checklist
CDI	Children's Depression Scale
CMAS	Children's Manifest Anxiety Scale
CONNORS-P / CONNORS-T	Connors Parent Rating Scale, Connors Teacher Rating Scale
CPQ	Children's Perception Questionnaire
CPSS	Computed-Presented Social Situations
CRD	Child-rearing Disagreements
CTS	Conflict Tactics Scale
DAS	Dyadic Adjustment Scale
DIS	Diagnostic Interview Schedule
EAS	EAS Temperament Survey
ECBI	Eyberg Child Behaviour Inventory
FACES II / FACESIII	Family Adaptability and Cohesion Scales II / Family Adaptability and Cohesion Scales III
GB	Graham-Berman's Brother-Sister Questionnaire

Abbreviations (continued)

GHQ	General Health Questionnaire
LES	Life Event Survey
LES-C	Life Event Scale
LBC	Louisville Behavior Checklist
MAT / SMAT	Marital Adjustment Test, Short Marital Adjustment Test
McDANIEL-PIERS	McDaniel-Piers Young Children's Self-Concept Scale
MCDI	Minnesota Child Development Inventory
MPSCS	Maryland Preschool Self-concept Scale
MSCA	McCarthy Scale of Children's Abilities
NEALE	Neale Analysis of Reading Ability -Revised
OPS	O'Leary-Porter Scale
PAQ	Parental Authority Questionnaire
PBI	Schaefer's Children's Report of Parental Behaviour Inventory
PCS	Pictorial Scale of Perceived Competence and Social Acceptance for Young Children
PIERS-HARRIS	Piers-Harris Children's Self-Concept Scale
PPBFI	Porter Parental Behaviour and Feeling Inventory
PTF	Temperament Assessment Battery for Children - Parent's Version
PSI	Parenting Stress Index
RBPC	Revised Behaviour Problem Checklist

Abbreviations (continued)

RCMAS	Revised Children's Manifest Anxiety Scale
SMAT	Short Marital Adjustment Test
SMAST	Short Michigan Alcoholism Screening Test
SPPC	Self Perception Profile for Children
SRQ	Supportive Relationship Questionnaire
VABS	Vineland Adaptive Behaviour Scales
WISC-R	Wechler Intelligence Scale for Children-Revised
WPAQ	Westra Preschool Assessment Questionnaire
YSR	Youth Self-Report

Appendix B

Correlation/Covariance Matrices

Correlation/Covariance Matrix for Model I: Preschool Children [a]

	X_1	X_2	X_3	X_4	X_5	X_6	X_7	X_8	X_9
X_1	1.0000 1.0139								
X_2	.2043 .2195	1.0000 1.1378							
X_3	-.1156 -.5998	-.1280 -.7032	1.0000 26.5338						
X_4	.1047 .1754	.1361 .2415	-.0158 -.1353	1.0000 2.7686					
X_5	.2569 .2593	.2851 .3049	-.1997 -1.0312	.2808 .4684	1.0000 1.0050				
X_6	-.1735 -.0624	-.0885 -.0337	.2063 .3794	-.0593 -.0352	-.4559 -.1631	1.0000 .1274			
X_7	.1549 .1277	.0010 .0008	.0121 .0511	-.0563 -.0767	-.1085 -.0890	-.1910 -.0558	1.0000 .6698		
X_8	-.0875 -.0592	-.1292 -.0926	.1721 .5959	.0182 .0203	-.1510 -.1017	.1408 .0338	-.0683 -.0376	1.0000 .4519	
X_9	-.0412 -.0207	-.0322 -.0172	-.0219 -.0565	-.0289 -.0240	-.0249 -.0125	-.0161 -.0029	.0436 .0179	-.0095 -.0032	1.0000 .2501
Y_1	-.0067 -.0024	-.0483 -.0187	.1410 .2631	-.0478 -.0288	-.1320 -.0479	.1369 .0177	.0857 .0254	.1327 .0323	-.0010 -.0002
Y_2	-.0037 -.0103	.0706 .2093	-.1711 -2.4507	-.0322 -.1487	.0110 .0306	-.0275 -.0273	-.0863 -.1964	-.0884 -.1652	.0018 .0025
Y_3	-.0810 -.1566	-.0027 -.0056	.1788 1.7679	.0201 .0643	-.0556 -.1071	.0409 .0280	.1037 .1629	.0768 .0991	.0986 .0946
Y_4	-.0639 -.0864	-.0056 -.0080	.1752 1.2131	-.0112 -.0251	-.0572 -.0770	.1038 .0498	.0001 .0001	.0883 .0798	-.0423 -.0284
Y_5	-.0915 -.1992	.0048 .0111	.2934 3.2671	.0374 .1345	-.0936 -.2028	.0984 .0759	-.0734 -.1298	.0708 .1029	-.0167 -.0181
Y_6	-.0503 -.2057	.0418 .1812	-.0467 -.9784	.0094 .0633	.0048 .0196	-.0132 -.0191	-.0574 -.1908	-.0603 -.1648	-.1597 -.3245

	Y_1	Y_2	Y_3	Y_4	Y_5	Y_6
X_1						
X_2						
X_3						
X_4						
X_5						
X_6						
X_7						
X_8						
X_9						
Y_1	1.0000 .1312					
Y_2	-.0881 -.0887	1.0000 7.7312				
Y_3	.1407 .0979	-.0871 -.4651	1.0000 3.6864			
Y_4	.0945 .0460	-.1054 -.3940	.3240 .8360	1.0000 1.8063		
Y_5	.1130 .0885	-.1345 -.8083	.3475 1.4423	.2626 .7629	1.0000 4.6717	
Y_6	-.0580 -.0854	.2408 2.7214	-.1502 -1.1721	.0176 .0959	-.0105 -.0926	1.0000 16.5157

[a] $n = 3014$

Correlation/Covariance Matrix for Model II: Young School-Age Children [a]

	X_1	X_2	X_3	X_4	X_5	X_6	X_7	X_8	X_9
X_1	1.0000 .8777								
X_2	.2457 .2474	1.0000 1.1553							
X_3	-.0969 -.5053	-.1346 -.8049	1.0000 30.9629						
X_4	.1125 .1801	.2100 .3859	-.0607 -.5774	1.0000 2.9231					
X_5	.2961 .2750	.3500 .3730	-.2264 -1.2488	.2751 .4664	1.0000 .9830				
X_6	-.1408 -.0467	-.0850 -.0324	.2360 .4649	-.0359 -.0217	-.3899 -.1369	1.0000 .1253			
X_7	.0390 .0310	-.0193 -.0175	-.0112 -.0527	-.0617 -.0893	-.1179 -.0990	-.1663 -.0499	1.0000 .7169		
X_8	-.0963 -.0581	-.1003 -.0694	.0683 .2447	.0518 .0570	-.0732 -.0467	.0426 .0097	-.0349 -.0190	1.0000 .4146	
X_9	.0049 .0023	.0052 .0028	.0046 .0128	.0025 .0022	-.0046 -.0023	-.0120 -.0021	-.0084 -.0035	.0197 .0063	1.0000 .2500
Y_1	.0208 .0075	-.0322 -.0133	.1249 .2675	.0264 .0173	-.1012 -.0386	.0913 .0124	.1210 .0394	.1053 .0261	-.0140 -.0027
Y_2	-.0505 -.1348	.0574 .1759	-.1117 -1.7722	-.0348 -.1697	.0386 .1090	-.0091 -.0092	-.1549 -.3741	-.0939 -.1724	-.0067 -.0095
Y_3	-.0752 -.1314	-.0312 -.0625	.1529 1.5871	.0566 .1805	-.0920 -.1701	.1156 .0763	.0540 .0853	.0683 .0820	.1661 .1549
Y_4	-.0719 -.1191	-.0462 -.0878	.1668 1.6415	.0555 .1678	-.0866 -.1519	.1027 .0643	-.0009 -.0014	.0668 .0760	-.0658 -.0581
Y_5	-.0869 -.2094	-.0206 -.0569	.2880 4.1222	.0166 .0729	-.0747 -.1904	.1205 .1098	-.0711 -.1548	.0626 .1037	.0135 .0174
Y_6	-.0151 -.0535	0751 .3054	.0118 .2488	-.0281 -.1817	.0427 .1601	-.0120 -.0160	-.0462 -.1480	-.0998 -.2431	-.2068 -.3912

	Y_1	Y_2	Y_3	Y_4	Y_5	Y_6
X_1						
X_2						
X_3						
X_4						
X_5						
X_6						
X_7						
X_8						
X_9						
Y_1	1.0000 .1482					
Y_2	-.0883 -.0970	1.0000 8.1318				
Y_3	.1109 .0796	-.0960 -.5107	1.0000 3.4794			
Y_4	.0925 .0629	-.1246 -.6281	.4664 1.5383	1.0000 3.1268		
Y_5	.0899 .0890	-.1272 -.9329	.4163 1.9973	.3318 1.5093	1.0000 6.6160	
Y_6	-.0664 -.0967	.2847 3.0712	-.2129 -1.5026	-.1221 -.8168	-.0574 -.5585	1.0000 14.3133

[a] $\underline{n} = 5553$

Correlation/Covariance Matrix for Model III: Older School-Age Children [a]

	X_1	X_2	X_3	X_4	X_5	X_6	X_7	X_8	X_9
X_1	1.0000 .6969								
X_2	.2306 .2130	1.0000 1.2250							
X_3	-.1086 -.5359	-.1207 -.7898	1.0000 34.9495						
X_4	.1397 .2094	.2149 .4272	-.0773 -.8207	1.0000 3.2251					
X_5	.2790 .2267	.3655 .3938	-.3002 -1.7271	.2546 .4450	1.0000 .9473				
X_6	-.0843 -.0255	-.0174 -.0070	.2570 .5515	-.0114 -.0074	-.3497 -.1235	1.0000 .1318			
X_7	-.1146 -.0800	-.0194 -.0180	.0253 .1251	-.0681 -.1023	-.2040 -.1660	-.1142 -.0347	1.0000 .6992		
X_8	-.1101 -.0597	-.1096 -.0788	.2089 .8022	.0200 .0234	-.1540 -.0973	.1041 .0245	-.0375 -.0204	1.0000 .4217	
X_9	.0305 .0127	.0632 .0350	-.0409 -.1209	.0134 .0120	.0347 .0169	-.0820 -.0149	.0450 .0188	.0207 .0067	1.0000 .2501
Y_1	.0174 .0064	-.0141 -.0069	.0915 .2401	-.0044 -.0035	-.0844 -.0365	.0439 .0071	.2016 .0748	.0579 .0167	.0587 .0130
Y_2	-.0106 -.0249	.0450 .1399	-.0852 -1.4132	-.0616 -.3103	.0829 .2266	-.0911 -.0928	-.1644 -.3859	-.1045 -.1905	.0108 .0152
Y_3	-.0948 -.1368	-.0203 -.0389	.1929 1.9694	-.0313 -.0970	-.1533 -.2577	.1264 .0792	.1399 .2021	.1097 .1231	.1190 .1028
Y_4	-.1055 -.1553	-.0856 -.1671	.2646 2.7591	-.0424 -.1343	-.1436 -.2464	.1242 .0795	.0172 .0254	.1171 .1341	-.0745 -.0657
Y_5	-.0661 -.1532	-.0429 -.1319	.3015 4.9467	-.0025 -.0124	-.0955 -.2579	.1540 .1552	-.0141 -.0326	.0752 .1356	-.0469 -.0651
Y_6	-.0008 -.0024	.0536 .2107	.0142 .2991	-.0205 -.1308	.0898 .3106	-.0482 -.0621	-.0836 -.2483	-.0720 -.1661	-.1750 -.3110

	Y_1	Y_2	Y_3	Y_4	Y_5	Y_6
X_1						
X_2						
X_3						
X_4						
X_5						
X_6						
X_7						
X_8						
X_9						
Y_1	1.0000 .1971					
Y_2	-.0724 -.0902	1.0000 7.8802				
Y_3	.1759 .1349	-.1365 -.6619	1.0000 2.9833			
Y_4	.0201 .0157	-.1242 -.6148	.4572 1.3927	1.0000 3.1100		
Y_5	.0505 .0622	-.1557 -1.2129	.4013 1.9238	.3980 1.9484	1.0000 7.7046	
Y_6	-.0817 -.1288	.2732 2.7252	-.2799 -1.7177	-.1299 -.8141	-.0662 -.6530	1.0000 12.6240

[a] $\underline{n} = 2654$

Correlation/Covariance Matrix for Model IV - Children's Own Reports [a]

	X_1	X_2	X_3	X_4	X_5	X_6	X_7	X_8	X_9
X_1	1.0000								
	.7110								
X_2	.2250	1.0000							
	.2067	1.1873							
X_3	-.1017	-.0971	1.0000						
	-.5049	-.6228	34.7681						
X_4	.1247	.1882	-.0565	1.0000					
	.1889	.3682	-.5976	3.2245					
X_5	.2833	.3323	-.2999	.2460	1.0000				
	.2315	.3508	-1.7112	.4281	.9389				
X_6	-.0869	-.0211	.2409	-.0238	-.3551	1.0000			
	-.0263	-.0083	.5095	-.0153	-.1236	.1290			
X_7	-.1056	-.0079	.0036	-.0642	-.1994	-.1207	1.0000		
	-.0752	-.0073	.0181	-.0973	-.1632	-.0366	.7135		
X_8	-.1124	-.1130	.2283	-.0009	-.1737	.1219	-.0400	1.0000	
	-.0621	-.0807	.8808	-.0011	-.1103	.0287	-.0221	.4293	
X_9	.0179	.0894	-.0520	.0030	.0575	-.0804	.0312	.0111	1.0000
	.0075	.0487	-.1532	.0027	.0279	-.0144	.0132	.0036	.2499
Y_1	.0336	-.0145	.0580	.0052	-.0862	.0341	.1979	.0724	.0778
	.0127	-.0071	.1535	.0042	-.0376	.0055	.0752	.0213	.0175
Y_2	.0072	.0417	-.0793	-.0405	.0930	-.1097	-.1667	-.1258	.0371
	.0169	.1260	-1.2953	-.2015	.2498	-.1092	-.3905	-.2285	.0514
Y_3	.0674	.0416	-.1169	.0315	.1037	-.0905	-.0996	-.0980	-.0609
	.1618	.1289	-1.9601	.1611	.2862	-.0926	-.2397	-.1829	-.0868
Y_4	-.0925	-.0047	.1642	-.0182	-.1469	.1456	.1405	.1150	.1153
	-.1332	-.0087	1.6516	-.0558	-.2431	.0893	.2027	.1287	.0984
Y_5	-.0543	-.0268	.1280	-.0529	-.0812	.0436	.0494	.1416	.2364
	-.0814	-.0520	1.3405	-.1689	-.1399	.0278	.0741	.1650	.2101
Y_6	-.1141	-.0974	.2684	-.0372	-.1516	.1349	.0153	.1334	-.0800
	-.1724	-.1902	2.8319	-.1197	-.2633	.0868	.0232	.1567	-.0717
Y_7	-.0216	-.0442	.1427	.0054	-.0182	.0433	.0046	.0894	.0139
	-.0361	-.0956	1.6663	.0192	-.0349	.0308	.0076	.1162	.0138
Y_8	-.0666	-.0550	.3242	.0040	-.1180	.1653	-.0108	.0708	-.0673
	-.1556	-.1661	5.2883	.0199	-.3167	.1645	-.0253	.1285	-.0931
Y_9	-.0436	-.0758	.1164	-.0471	-.0813	.0898	.0123	.0487	-.0792
	-.1048	-.2353	1.9529	-.2412	-.2244	.0919	.0297	.0909	-.1128

	Y_1	Y_2	Y_3	Y_4	Y_5	Y_6	Y_7	Y_8	Y_9
X_1									
X_2									
X_3									
X_4									
X_5									
X_6									
X_7									
X_8									
X_9									
Y_1	1.0000 .2023								
Y_2	-.0809 -.1008	1.0000 7.6851							
Y_3	-.0186 -.0239	.1702 1.3432	1.0000 8.1085						
Y_4	.1807 .1388	-.1538 -.7282	-.1463 -.7116	1.0000 2.9168					
Y_5	.0696 .0557	-.0600 -.2957	-.2106 -1.0667	.3048 .9257	1.0000 3.1633				
Y_6	-.0013 -.0011	-.1260 -.6257	-.1120 -.5714	.4509 1.3800	.2012 .6411	1.0000 3.2112			
Y_7	.0494 .0440	-.0848 -.4665	-.1966 -1.1100	.1676 .5676	.5041 1.7782	.2667 .9477	1.0000 3.9329		
Y_8	.0384 .0478	-.1668 -1.2807	-.1869 -1.4743	.3775 1.7856	.1179 .5808	.3873 1.9223	.1357 .7453	1.0000 7.6724	
Y_9	.0406 .0521	-.0435 -.3436	-.2465 -2.0001	.1178 .5735	.3213 1.6283	.1344 .6864	.3572 2.0186	.3137 2.4759	1.0000 8.1194

	X_1	X_2	X_3	X_4	X_5	X_6	X_7	X_8	X_9
Y_{10}	.0097	.0516	.0177	.0005	-.0800	-.0565	-.0832	-.0906	-.1515
	.0289	.1984	.3688	.0030	.2736	-.0717	-.2480	-.2095	-.2672
Y_{11}	.0142	.0078	-.0736	.0261	.0248	-.0020	-.0700	-.0518	-.1926
	.0420	.0298	-1.5231	.1650	.0846	-.0025	-.2078	-.1194	-.3384

	Y_1	Y_2	Y_3	Y_4	Y_5	Y_6	Y_7	Y_8	Y_9
Y_{10}	-.0928	.2653	.1764	-.3270	-.1596	-.1369	-.0548	-.0602	-.0036
	-.1473	2.5957	1.7722	-1.9710	-1.0019	-.8657	-.3839	-.5889	.0364
Y_{11}	.0238	.1046	.4475	-.1498	-.2567	-.1296	-.2529	-.1489	-.0668
	.0376	1.0192	4.4796	-.8996	-1.6050	-.8164	-1.7628	-1.4499	-.6696

	Y_{10}	Y_{11}
Y_{10}	1.0000	
	12.4545	
Y_{11}	.2687	1.0000
	3.3334	12.3578

[a] $\underline{n} = 2174$

Correlation/Covariance Matrix for Model V: Multiple Indicator Model with Preschool Children [a]

	X_1	X_2	X_3	X_4	X_5	X_6	X_7	X_8	X_9	X_{10}
X_1	1.0000 1.0139									
X_2	.2043 .2195	1.0000 1.1378								
X_3	-.0353 -.0248	-.1026 -.0765	1.0000 .4878							
X_4	-.0564 -.0377	-.0731 -.0517	.6562 .3041	1.0000 .4404						
X_5	-.0252 -.0173	-.0894 -.0649	.4488 .2134	.4587 .2073	1.0000 .4637					
X_6	.1047 .1754	.1361 .2415	-.0150 -.0174	-.0360 -.0398	-.0418 -.0473	1.0000 2.7686				
X_7	.2569 .2593	.2851 .3049	-.1223 -.0856	-.1247 -.0829	-.1692 -.1155	.2808 .4684	1.0000 1.0050			
X_8	-.1735 -.0624	-.0885 -.0337	.1346 .0336	.1279 .0303	.1568 .0381	-.0593 -.0352	-.4559 -.1631	1.0000 .1274		
X_9	.1549 .1277	.0010 .0008	.0267 .0153	.0302 .0164	.0333 .0186	-.0563 -.0767	-.1085 -.0890	-.1910 -.0558	1.0000 .6698	
X_{10}	-.0875 -.0592	-.1292 -.0926	.1070 .0503	.0646 .0288	.1204 .0551	.0182 .0203	-.1510 -.1017	.1408 .0338	-.0683 -.0376	1.0000 .4519
X_{11}	-.0412 -.0207	-.0322 -.0172	-.0335 -.0117	-.0237 -.0079	-.0027 -.0009	-.0289 -.0240	-.0249 -.0125	-.0161 -.0029	.0436 .0179	-.0095 -.0032
Y_1	-.0067 -.0024	-.0483 -.0187	.1169 .0296	.1022 .0246	.1178 .0290	-.0478 -.0288	-.1320 -.0479	.1369 .0177	.0857 .0254	.1327 .0323
Y_2	.0008 .0006	.0305 .0248	-.1099 -.0585	-.1029 -.0520	-.1270 -.0659	-.0401 -.0508	-.0033 -.0025	.0182 .0050	-.1280 -.0798	-.0337 -.0173
Y_3	.0412 .0357	.0496 .0455	-.0773 -.0464	-.0520 -.0297	-.0506 -.0296	-.0603 -.0864	-.0201 -.0173	-.0414 -.0127	.0184 .0130	-.0539 -.0312
Y_4	-.0328 -.0145	-.0019 -.0009	.0774 .0238	-.0007 -.0002	.0485 .0145	.0130 .0095	-.0305 -.0134	.0332 .0052	.0868 .0313	.0485 .0143
Y_5	-.0531 -.0303	.0173 .0105	.1401 .0555	.1047 .0394	.1279 .0494	.0510 .0482	-.0114 -.0065	-.0013 -.0003	.0662 .0308	.0224 .0086
Y_6	-.0474 -.0208	.0195 .0091	.1212 .0369	.0963 .0278	.0566 .0168	.0017 .0012	-.0336 -.0147	.1063 .0165	-.0184 -.0066	.0715 .0209
Y_7	-.0653 -.0238	-.0031 -.0012	.1188 .0300	.1374 .0330	.0975 .0240	-.0149 -.0090	-.0792 -.0287	.0373 .0048	.0507 .0150	.0407 .0099

	X_{11}	Y_1	Y_2	Y_3	Y_4	Y_5	Y_6	Y_7	Y_8	Y_9
X_1										
X_2										
X_3										
X_4										
X_5										
X_6										
X_7										
X_8										
X_9										
X_{10}										
X_{11}	1.0000 .2501									
Y_1	-.0010 -.0002	1.0000 .1312								
Y_2	-.0147 -.0056	-.0758 -.0209	1.0000 .5801							
Y_3	.0097 .0042	-.0307 -.0096	.3780 .2477	1.0000 .7399						
Y_4	.1229 .0270	.0956 .0152	-.0240 -.0080	-.0492 -.0186	1.0000 .1935					
Y_5	.0589 .0167	.0906 .0186	-.0878 -.0380	-.0653 -.0319	.4146 .1035	1.0000 .3222				
Y_6	-.0497 -.0108	.0760 .0120	-.0357 -.0118	-.0482 -.0180	.1368 .0262	.0977 .0242	1.0000 .1897			
Y_7	-.0181 -.0033	.1210 .0158	-.0951 -.0262	-.0152 -.0047	.1384 .0220	.1315 .0270	.4221 .0665	1.0000 .1307		

	X_1	X_2	X_3	X_4	X_5	X_6	X_7	X_8	X_9	X_{10}
Y_8	-.0160	.0506	.1080	.1072	.0853	.0490	-.0424	.0455	-.0114	.0591
	-.0069	.0230	.0321	.0303	.0247	.0347	-.0181	.0069	-.0040	.0169
Y_9	-.0263	.0549	.1250	.1492	.1405	.0608	-.0527	.0793	-.0307	.0272
	-.0116	.0256	.0382	.0433	.0419	.0443	-.0231	.0124	-.0110	.0080
Y_{10}	-.0238	.0421	-.0183	.0401	-.0365	.0017	-.0098	-.0143	.0061	-.0559
	-.0152	.0284	-.0081	.0168	-.0157	.0017	-.0062	-.0032	.0032	-.0237
Y_{11}	-.0633	.0421	-.0624	-.0243	-.0577	.0356	.0163	.0309	-.0665	-.0290
	-.0389	.0274	-.0266	-.0098	-.0240	.0362	.0099	.0067	-.0332	-.0119
Y_{12}	-.0559	.0461	-.0255	.0240	-.0225	.0499	.0436	-.0172	-.0049	-.0636
	-.0337	.0294	-.0107	.0095	-.0092	.0496	.0262	-.0037	-.0024	-.0256

	X_{11}	Y_1	Y_2	Y_3	Y_4	Y_5	Y_6	Y_7	Y_8	Y_9
Y_8	.0013	.0918	-.0420	-.0562	.1706	.1986	.1955	.1363	1.0000	
	.0003	.0142	-.0136	-.0206	.0319	.0480	.0362	.0210	.1811	
Y_9	-.0233	.0795	-.0829	-.1311	.1446	.2021	.1795	.1437	.4058	1.0000
	-.0051	.0126	-.0276	-.0494	.0279	.0502	.0342	.0227	.0756	.1918
Y_{10}	-.1780	-.0338	.1034	.1357	-.0801	-.0350	.0676	.0510	-.0103	-.0035
	-.0563	-.0077	.0498	.0738	-.0223	-.0125	.0186	.0116	-.0028	-.0010
Y_{11}	-.1311	-.0904	.1564	.0772	-.0707	-.0421	.0491	.0043	-.0374	.0311
	-.0400	-.0200	.0727	.0405	-.0190	-.0146	.0131	.0009	-.0097	.0083
Y_{12}	-.1241	-.0404	.1350	.1090	-.0922	-.0369	.0280	-.0007	-.0464	-.0182
	-.0371	-.0088	.0615	.0561	-.0243	-.0125	.0073	-.0002	-.0118	-.0048

	Y_{10}	Y_{11}	Y_{12}
Y_8			
Y_9			
Y_{10}	1.0000		
	.3995		
Y_{11}	.4647	1.0000	
	.1792	.3724	
Y_{12}	.5278	.4688	1.0000
	.1996	.1712	.3581

[a] $\underline{n} = 3014$

Appendix C

Matrix Equations

Matrix Equations for Models I, II, and III

The structural relations among the concepts are expressed in the basic equation:

$$\eta = B\eta + \Gamma\xi + \zeta$$

$$\begin{bmatrix}\eta_1\\ \eta_2\\ \eta_3\\ \eta_4\\ \eta_5\\ \eta_6\end{bmatrix} = \begin{bmatrix}0 & 0 & 0 & 0 & 0 & 0\\ 0 & 0 & 0 & 0 & 0 & 0\\ \beta_{3,1} & \beta_{3,2} & 0 & 0 & 0 & 0\\ \beta_{4,1} & \beta_{4,2} & 0 & 0 & 0 & 0\\ 0 & \beta_{5,2} & 0 & 0 & 0 & 0\\ 0 & \beta_{6,2} & 0 & 0 & 0 & 0\end{bmatrix} \begin{bmatrix}\eta_1\\ \eta_2\\ \eta_3\\ \eta_4\\ \eta_5\\ \eta_6\end{bmatrix} + \begin{bmatrix}0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \gamma_{1,10}\\ \gamma_{2,1} & \gamma_{2,2} & \gamma_{2,3} & \gamma_{2,4} & \gamma_{2,5} & \gamma_{2,6} & \gamma_{2,7} & \gamma_{2,8} & 0 & \gamma_{2,10}\\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \gamma_{3,9} & 0\\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \gamma_{4,9} & 0\\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \gamma_{5,9} & 0\\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \gamma_{6,9} & 0\end{bmatrix} \begin{bmatrix}\xi_1\\ \xi_2\\ \xi_3\\ \xi_4\\ \xi_5\\ \xi_6\\ \xi_7\\ \xi_8\\ \xi_9\\ \xi_{10}\end{bmatrix} + \begin{bmatrix}\zeta_1\\ \zeta_2\\ \zeta_3\\ \zeta_4\\ \zeta_5\\ \zeta_6\end{bmatrix}$$

This equation links the endogenous concepts to their observed indicators:

$$y = \Lambda_y\eta + \epsilon$$

$$\begin{bmatrix}y_1\\ y_2\\ y_3\\ y_4\\ y_5\\ y_6\end{bmatrix} = \begin{bmatrix}1 & 0 & 0 & 0 & 0 & 0\\ 0 & 1 & 0 & 0 & 0 & 0\\ 0 & 0 & 1 & 0 & 0 & 0\\ 0 & 0 & 0 & 1 & 0 & 0\\ 0 & 0 & 0 & 0 & 1 & 0\\ 0 & 0 & 0 & 0 & 0 & 1\end{bmatrix} \begin{bmatrix}\eta_1\\ \eta_2\\ \eta_3\\ \eta_4\\ \eta_5\\ \eta_6\end{bmatrix} + \begin{bmatrix}\epsilon_1\\ \epsilon_2\\ \epsilon_3\\ \epsilon_4\\ \epsilon_5\\ \epsilon_6\end{bmatrix}$$

This equation links the exogenous concepts to their observed indicators:

$$x = \Lambda_x\xi + \delta$$

$$\begin{bmatrix}x_1\\ x_2\\ x_3\\ x_4\\ x_5\\ x_6\\ x_7\\ x_8\\ x_9\end{bmatrix} = \begin{bmatrix}1 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0\\ 0 & 1 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0\\ 0 & 0 & 1 & 0 & 0 & 0 & 0 & 0 & 0 & 0\\ 0 & 0 & 0 & 1 & 0 & 0 & 0 & 0 & 0 & 0\\ 0 & 0 & 0 & 0 & 1 & 0 & 0 & 0 & 0 & 0\\ 0 & 0 & 0 & 0 & 0 & 1 & 0 & 0 & 0 & 0\\ 0 & 0 & 0 & 0 & 0 & 0 & 1 & 0 & 0 & 0\\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 1 & 0 & 0\\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 1 & 0\end{bmatrix} \begin{bmatrix}\xi_1\\ \xi_2\\ \xi_3\\ \xi_4\\ \xi_5\\ \xi_6\\ \xi_7\\ \xi_8\\ \xi_9\\ \xi_{10}\end{bmatrix} + \begin{bmatrix}\delta_1\\ \delta_2\\ \delta_3\\ \delta_4\\ \delta_5\\ \delta_6\\ \delta_7\\ \delta_8\\ \delta_9\end{bmatrix}$$

Matrix Equations for Model IV

The structural relations among the concepts are expressed in the basic equation:

$$\eta = B\eta + \Gamma\xi + \zeta$$

$$\begin{bmatrix}\eta_1\\ \eta_2\\ \eta_3\\ \eta_4\\ \eta_5\\ \eta_6\end{bmatrix} = \begin{bmatrix}0 & 0 & 0 & 0 & 0 & 0\\ 0 & 0 & 0 & 0 & 0 & 0\\ \beta_{3,1} & \beta_{3,2} & 0 & 0 & 0 & 0\\ \beta_{4,1} & \beta_{4,2} & 0 & 0 & 0 & 0\\ 0 & \beta_{5,2} & 0 & 0 & 0 & 0\\ 0 & \beta_{6,2} & 0 & 0 & 0 & 0\end{bmatrix}\begin{bmatrix}\eta_1\\ \eta_2\\ \eta_3\\ \eta_4\\ \eta_5\\ \eta_6\end{bmatrix} + \begin{bmatrix}0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \gamma_{1,10}\\ \gamma_{2,1} & \gamma_{2,2} & \gamma_{2,3} & \gamma_{2,4} & \gamma_{2,5} & \gamma_{2,6} & \gamma_{2,7} & \gamma_{2,8} & 0 & \gamma_{2,10}\\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \gamma_{3,9} & 0\\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \gamma_{4,9} & 0\\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \gamma_{5,9} & 0\\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \gamma_{6,9} & 0\end{bmatrix}\begin{bmatrix}\xi_1\\ \xi_2\\ \xi_3\\ \xi_4\\ \xi_5\\ \xi_6\\ \xi_7\\ \xi_8\\ \xi_9\\ \xi_{10}\end{bmatrix} + \begin{bmatrix}\zeta_1\\ \zeta_2\\ \zeta_3\\ \zeta_4\\ \zeta_5\\ \zeta_6\end{bmatrix}$$

This equation links the endogenous concepts to their observed indicators:

$$y = \Lambda_y\eta + \epsilon$$

$$\begin{bmatrix}y_1\\ y_2\\ y_3\\ y_4\\ y_5\\ y_6\\ y_7\\ y_8\\ y_9\\ y_{10}\\ y_{11}\end{bmatrix} = \begin{bmatrix}1 & 0 & 0 & 0 & 0 & 0\\ 0 & \lambda_{2,2} & 0 & 0 & 0 & 0\\ 0 & \lambda_{3,2} & 0 & 0 & 0 & 0\\ 0 & 0 & \lambda_{4,3} & 0 & 0 & 0\\ 0 & 0 & \lambda_{5,3} & 0 & 0 & 0\\ 0 & 0 & 0 & \lambda_{6,4} & 0 & 0\\ 0 & 0 & 0 & \lambda_{7,4} & 0 & 0\\ 0 & 0 & 0 & 0 & \lambda_{8,5} & 0\\ 0 & 0 & 0 & 0 & \lambda_{9,5} & 0\\ 0 & 0 & 0 & 0 & 0 & \lambda_{10,6}\\ 0 & 0 & 0 & 0 & 0 & \lambda_{11,6}\end{bmatrix}\begin{bmatrix}\eta_1\\ \eta_2\\ \eta_3\\ \eta_4\\ \eta_5\\ \eta_6\end{bmatrix} + \begin{bmatrix}\epsilon_1\\ \epsilon_2\\ \epsilon_3\\ \epsilon_4\\ \epsilon_5\\ \epsilon_6\\ \epsilon_7\\ \epsilon_8\\ \epsilon_9\\ \epsilon_{10}\\ \epsilon_{11}\end{bmatrix}$$

This equation links the exogenous concepts to their observed indicators:

$$\mathbf{x} = \Lambda_x \xi + \delta$$

$$\begin{bmatrix} x_1 \\ x_2 \\ x_3 \\ x_4 \\ x_5 \\ x_6 \\ x_7 \\ x_8 \\ x_9 \end{bmatrix} = \begin{bmatrix} 1 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 1 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 1 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 1 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 1 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 1 & 0 \end{bmatrix} \begin{bmatrix} \xi_1 \\ \xi_2 \\ \xi_3 \\ \xi_4 \\ \xi_5 \\ \xi_6 \\ \xi_7 \\ \xi_8 \\ \xi_9 \\ \xi_{10} \end{bmatrix} + \begin{bmatrix} \delta_1 \\ \delta_2 \\ \delta_3 \\ \delta_4 \\ \delta_5 \\ \delta_6 \\ \delta_7 \\ \delta_8 \\ \delta_9 \end{bmatrix}$$

Matrix Equations for Model V

The structural relations among the concepts are expressed in the basic equation:

$$\eta = B\eta + \Gamma\xi + \zeta$$

$$\begin{bmatrix}\eta_1\\ \eta_2\\ \eta_3\\ \eta_4\\ \eta_5\\ \eta_6\end{bmatrix} = \begin{bmatrix}0 & 0 & 0 & 0 & 0 & 0\\ 0 & 0 & 0 & 0 & 0 & 0\\ \beta_{3,1} & \beta_{3,2} & 0 & 0 & 0 & 0\\ \beta_{4,1} & \beta_{4,2} & 0 & 0 & 0 & 0\\ 0 & \beta_{5,2} & 0 & 0 & 0 & 0\\ 0 & \beta_{6,2} & 0 & 0 & 0 & 0\end{bmatrix}\begin{bmatrix}\eta_1\\ \eta_2\\ \eta_3\\ \eta_4\\ \eta_5\\ \eta_6\end{bmatrix} + \begin{bmatrix}0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \gamma_{1,10}\\ \gamma_{2,1} & \gamma_{2,2} & \gamma_{2,3} & \gamma_{2,4} & \gamma_{2,5} & \gamma_{2,6} & \gamma_{2,7} & \gamma_{2,8} & 0 & \gamma_{2,10}\\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \gamma_{3,9} & 0\\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \gamma_{4,9} & 0\\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \gamma_{5,9} & 0\\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \gamma_{6,9} & 0\end{bmatrix}\begin{bmatrix}\xi_1\\ \xi_2\\ \xi_3\\ \xi_4\\ \xi_5\\ \xi_6\\ \xi_7\\ \xi_8\\ \xi_9\\ \xi_{10}\end{bmatrix} + \begin{bmatrix}\zeta_1\\ \zeta_2\\ \zeta_3\\ \zeta_4\\ \zeta_5\\ \zeta_6\end{bmatrix}$$

This equation links the endogenous concepts to their observed indicators:

$$y = \Lambda_y\eta + \epsilon$$

$$\begin{bmatrix}y_1\\ y_2\\ y_3\\ y_4\\ y_5\\ y_6\\ y_7\\ y_8\\ y_9\\ y_{10}\\ y_{11}\\ y_{12}\end{bmatrix} = \begin{bmatrix}1 & 0 & 0 & 0 & 0 & 0\\ 0 & \lambda_{2,2} & 0 & 0 & 0 & 0\\ 0 & \lambda_{3,2} & 0 & 0 & 0 & 0\\ 0 & 0 & \lambda_{4,3} & 0 & 0 & 0\\ 0 & 0 & \lambda_{5,3} & 0 & 0 & 0\\ 0 & 0 & 0 & \lambda_{6,4} & 0 & 0\\ 0 & 0 & 0 & \lambda_{7,4} & 0 & 0\\ 0 & 0 & 0 & 0 & \lambda_{8,5} & 0\\ 0 & 0 & 0 & 0 & \lambda_{9,5} & 0\\ 0 & 0 & 0 & 0 & 0 & \lambda_{10,6}\\ 0 & 0 & 0 & 0 & 0 & \lambda_{11,6}\\ 0 & 0 & 0 & 0 & 0 & \lambda_{12,6}\end{bmatrix}\begin{bmatrix}\eta_1\\ \eta_2\\ \eta_3\\ \eta_4\\ \eta_5\\ \eta_6\end{bmatrix} + \begin{bmatrix}\epsilon_1\\ \epsilon_2\\ \epsilon_3\\ \epsilon_4\\ \epsilon_5\\ \epsilon_6\\ \epsilon_7\\ \epsilon_8\\ \epsilon_9\\ \epsilon_{10}\\ \epsilon_{11}\\ \epsilon_{12}\end{bmatrix}$$

This equation links the exogenous concepts to their observed indicators:

$$\mathbf{x} = \Lambda_x \xi + \delta$$

$$\begin{bmatrix} x_1 \\ x_2 \\ x_3 \\ x_4 \\ x_5 \\ x_6 \\ x_7 \\ x_8 \\ x_9 \\ x_{10} \\ x_{11} \end{bmatrix} = \begin{bmatrix} 1 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & \lambda_{3,3} & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & \lambda_{4,3} & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & \lambda_{5,3} & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 1 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 1 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 1 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 1 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 1 & 0 \end{bmatrix} \begin{bmatrix} \xi_1 \\ \xi_2 \\ \xi_3 \\ \xi_4 \\ \xi_5 \\ \xi_6 \\ \xi_7 \\ \xi_8 \\ \xi_9 \\ \xi_{10} \end{bmatrix} + \begin{bmatrix} \delta_1 \\ \delta_2 \\ \delta_3 \\ \delta_4 \\ \delta_5 \\ \delta_6 \\ \delta_7 \\ \delta_8 \\ \delta_9 \\ \delta_{10} \\ \delta_{11} \end{bmatrix}$$